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THE

OPHTHALMIC REVIEW

A MONTHLY RECORD OF OPHTHALMIC SCIENCE

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ON BLINDING OF THE RETINA BY DIRECT SUNLIGHT. A STUDY IN PROGNOSIS.

By George Mackay, M.D., F.R.C.S.E.

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Introduction.

A dazzling sensation and a physiological "after image" are the common sequels to a momentary glance at the sun, and providentially deter most persons from the risk of further exposure. But not infrequently scientific enthusiasm or natural curiosity gets the better of prudence, and more or less permanent injury to the sight is sustained from the focusing of the solar rays on the retina of the observer. The temptation is greatest, at least to the laity, during the progress of solar eclipses, and it is from such occasions that the clinical material for this paper has been chiefly drawn.

While one may conjecture that the masterful influence of direct sunlight upon the human eye must have been one of the earliest pathological experiences of mankind, and is tempted to speculate on its relation to sun worship and sun myths, one is surprised to find how few cases of ocular injury from such exposure have been recorded. They are not really rare, but have been little written about. Original cases in British literature may be

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counted on the fingers of one hand.[1] The statements in our text books are of the briefest. The data on which to base a prognosis are scattered and scanty. In the endeavour to secure for myself some assurance in pronouncing judgment on cases of this class, those which have come under my own observation have been examined with some care, and having had occasion to study the literature of the subject very minutely, I think it may be useful to set forth the result in detail for the benefit of English readers.

Part I.

Historical Survey.

"Atque etiam solem ipsum, siquis oculis inconniventibus velit intueri, oculos celeriter perdat; multique in solis defectibus cum eum affectum qui soli acciderat, planius nosse cuperent, fixis oculis solem intuentes, imprudentes prorsus fuerunt occæcati."

Thus wrote Galen in the days of Marcus Aurelius, perhaps quoting from his own experience, but probably summing up the traditions of the ages before, and putting the case rather more strongly than later observations altogether justify.

Hofmann, the commentator of Galen, in equally serious phraseology, states on the authority of Funccius that one of the Byzantine Emperors, Constantine VII. (A.D. 905-959) "lost his eyes" by observing an eclipse, and Daremberg, the French translator of several of Galen's works, states in a footnote that he had seen in Paris several cases of injury to the sight from this cause.

There is a tradition that Galileo, to whom, among other things, we owe the discovery of sun spots (1610), seriously impaired the sight of his right eye by these studies,[1] but I have not been able to trace the story to its origin.

---

[1] A good abstract of Sulzer's paper by Mr. Marcus Gunn, in the *London Medical Record*, 1883, p. 405, has supplied the best reference hitherto in British literature.

I believe that we owe to Reid, the learned Professor of Moral Philosophy in the University of Glasgow, the earliest precise description of the subjective sensations consequent upon a solar accident. It occurred in his own person. This is his account :[2]—

"In May, 1761, being occupied in making an exact meridian, in order to observe the transit of Venus, I rashly directed to the sun by my right eye the cross hairs of a small telescope. I had often done the like in my younger days with impunity ; but I suffered by it at last, which I mention as a warning to others.

"I soon observed a remarkable dimness in that eye, and for many weeks when I was in the dark or shut my eyes there appeared before the right eye a lucid spot, which trembled much like the image of the sun seen by reflection from water. This appearance grew fainter and less frequent by degrees, so that now there are seldom any remains of it. But some other very sensible effects of this hurt still remain. For, first, the sight of the right eye continues to be more dim than that of the left. Secondly, the nearest limit of distinct vision is more remote in the right eye than in the other, although before the time mentioned they were equal in both these respects, as I had found by many trials. But thirdly, what I chiefly intended to mention is that a straight line, in some circumstances, appears to the right eye to have a curvature in it. Thus, when I look upon a music book, and, shutting my left eye, direct the right to a point of the middle line of the five which compose the staff of music, the middle line appears dim indeed at the point to which the eye is directed, but straight ; at the same time, the two lines above it and the two below it appear to be bent outwards, and to be more distant from each other, and from the middle line, than at other parts of the staff to which the eye is not directed. Fourthly, although I have repeated this experiment times innumerable within these sixteen months, I do not find that custom and experience takes away this appearance of curvature in straight lines. Lastly, this appearance of curvature is perceptible when I look with the right eye only but not when I look with both eyes ; yet I see better with both eyes together than even with the left eye alone.

---

[1] Galen, De usu partium, Lib. x., iii. Hofmanni, Casp, Commentarii in Galeni de usu partium, Lib. x., p. 226 (1625, Frankfort a/ Maine).

In letters to Diodatus, of date July 4, 1637, and January 2, 1638, Galileo makes pathetic reference to the fact that he was menaced with complete blindness, because, having already lost the sight of his right eye, his left began to show signs of failure. He feared that soon "this universe, the limits of which he had extended a hundred or thousand times beyond that fixed by the science of his predecessors," would be reduced for Galileo "to the space occupied by his person."—See "Galilée, sa vie, ses decouvertes, et ses travaux," par Parchappe, pp. 274-5, Paris, 1866. His fears proved only too well founded. In his latter years he became quite blind, but apparently from an affection of the cornea.—See Brewster, "Martyrs of Science."

[2] Reid. "An Inquiry into the Human Mind on the Principles of Common Sense," 1801, 5th ed., p. 275.

"I have related this fact minutely as it is without regard to any hypothesis, because I think such uncommon facts deserve to be recorded. I shall leave it to others to conjecture the cause of this appearance. To me it seems probable *that a small part of the retina towards the centre is shrunk, and that thereby the contiguous parts are drawn nearer to the centre and to one another than they were before, and that objects whose images fall on these parts, appear at that distance from each other, which corresponds not to the interval of the parts in their present preternatural contraction, but to their interval in their natural and sound state.*"

I think I may here claim for Reid (1761) the credit (usually assigned to Förster[1]) of being the first to explain the nature of retinal macropsia, and, by implication, of metamorphopsia also. His test has not been surpassed.

It is the advance in our knowledge of microscopic anatomy which permitted Förster in more precise language to elaborate the explanation now accepted that when metamorphopsia is of retinal origin a closer approximation of the retinal cones, *e.g.*, by pathological cohesion accounts for an apparent enlargement (macropsia), and their wider separation, *e.g.*, by intervening exudation causes an apparent diminution (micropsia) of an object looked at or of certain of its dimensions.

---

[1] Förster. *Arch. f. Ophth.*, Bd. xx., Abth. 1, s. 54-57.

An eclipse of the sun in 1791 supplied Sömmering[1] with some patients, and another, probably about the beginning of this century, caused a soldier to consult Baron Larrey, the famous French surgeon. This unfortunate son of Mars had imprudently followed the progress of a solar eclipse with his right eye through a piece of opaque glass having a transparent point at its centre. Several weeks later he came complaining that soon after the event he was seized with vertigo and pain on the right side of his head, and found himself almost deprived of the sight of that eye. The persistence of the two latter symptoms brought him to Larrey, who found "the vessels of the eye injected with blood; the pupil a little less than that of the opposite eye, preserving however its natural movements, and vision very obscure or almost lost." The treatment was vigorous. "After two blood-lettings, one from the temporal artery, and the other from the jugular vein, Larrey ordered blisters to the temple and to the nape of the neck. Ice was then applied to the head, followed by moxas, which completely re-established the patient's sight, but he still retained a feeling of dull pain all over the right side of the head."[2]

In Warlomont's French translation ot Mackenzie's treatise (vol. ii., p. 821, Paris, 1857), another case of direct sunlight injury, sustained while determining a meridian with a small telescope, is given. It does not appear in the last English edition (1854).

Generally speaking, the cases recorded in the preophthalmoscopic period can aid us but little in framing prognostic rules, since the possible presence of other internal affections of the eye could not be excluded so long as the fundus was invisible to the clinician.

---

[1] Sömmering. Pflichten gegen die Augen, quoted by Arlt, "Krankheiten des Auges," p. 107.

[2] Larrey. "Recueil de Mémoires de Chirurgie," p. 227, Paris (1821), quoted by Mackenzie, "Diseases of the Eye," 4th ed., p. 1059 (1854).

The introduction of the ophthalmoscope (1851) made it possible to investigate to some extent objectively the tissue changes accompanying the visual defect. The literature of this newer period starts from observations by Edward Jaeger on cases seen by him after the eclipse of July 28, 1851.

Jaeger[1] remarks that, whereas he had previously seen cases which had got quite well, or in which the association of cause and effect was doubtful, he thought there must have been something exceptional about the eclipse of 1851, since fourteen cases had come before him in which certainly partial or complete blinding had followed as a result of observing the phenomenon.

He makes the following general statements about these fourteen cases :—The patients had looked directly at the sun between their fingers, or had used light red, blue or dark glasses. Most of them noticed a blinding immediately. The visual field appeared more or less uniformly dimmed, or only in the centre, by a mist obscuring the central part of any object. If the eye was covered, a sun-image appeared on a dull background in the same area. These appearances were frequently accompanied by a peculiar sensation in the eye of stretching, pressure, discomfort, fulness, or even pain. The symptoms of blinding decreased considerably after a shorter or longer time, yet in no case vanished altogether ; indeed, some patients had from the beginning a constant or always increasing loss of visual power.

Ophthalmoscopic Examination.—In eight cases there was no material change discovered in the fundus.

In four cases there was "visible exudation from the choroid."

---

[1] Jaeger, Ed. "Ueber Staar und Staar Operationen," p. 75, Wien (1854).

In two cases a malignant new growth was found in the fundus.

Of the two last he gives further details.[1]

The first, a woman, aged 44, watched the eclipse with her left eye through a smoked glass. Thereafter she had a painful sensation of blinding in this eye; it watered and a black mist appeared in the centre of the field. This progressed until she could only see objects in the upper third of the visual field. Signs of inflammation of the whole eye then set in, at first intermittently but soon became constant. She sought no advice until six months had elapsed, by which time she was suffering severe pain in the eye and head, and the eye was sightless.

Ophthalmoscopic examination showed chronic choroiditis, with a new growth springing from the macular region.

Under antiphlogistic treatment some improvement took place, the external inflammation diminished, and visual power was regained in the upper third of the field. The inflammation soon returned again, the growth advanced until it reached the back of the lens, the pupil dilated, vision failed entirely. Eventually, nearly a year after the accident, the eye was enucleated. On section, a growth of conical shape was found embedded in the choroid at the macula, and adherent to the sclerotic for three lines. It had caused detachment of the outer half of the retina, and had driven the lens before it up against the cornea. The inner half of the eye was free from disease. The growth had a beautiful bright yellow colour, and showed on section a rather granular structure. It consisted of a loose branching framework made up of fibre cells. The tissue was everywhere in a state of more or less advanced fatty degeneration.

Of the second case a much briefer report is given. A man of 48 had viewed the eclipse through a red glass before his left eye. He retained some peripheral vision, but the central part of his field seemed covered with a black disc.

---

[1] Jaeger. *Loc. cit.*, p. 77.

Ophthalmoscopic examination showed a growth the size of a pea at the macula. The growth was developing so slowly and with so little accompanying inflammation that the eye had not been enucleated at the time of publication.

Jaeger regarded each growth as malignant and applies the term Cancer ("Krebs") to both. Whether a pathologist would to-day apply that term is perhaps open to question. Fortunately no other observer has had to record so grave an experience.

In the early literature of the ophthalmoscopic period two or three other cases are reported in which the relation of cause and effect seems doubtful. Thus Arlt[1] in one passage (p. 107) stated that he had seen three cases of partial amaurosis from direct sunlight. In another (p. 127) he makes further reference apparently to the same cases, and remarks that one patient who had observed the eclipse of July 28, 1851, suffered thereafter from "chronic retinitis." He goes on to state that retinitis was also present in another of these patients first seen by him and afterwards described by Coccius[2] and figured by Ruete.[3] From a careful perusal of the report of Coccius I am of opinion that this case should be excluded from the list of direct sunlight injuries. The patient attributed his malady to sleeping in a desert place in bright sunlight; but his brother, who had suffered no such exposure, showed almost similar extensive pigmentary changes in the fundi, and stated that one eye was defective from childhood. From the description one is tempted to entertain a suspicion of retinitis pigmentosa as the probable explanation, while Ruete's plate shows extensive choroidal and retinal disturbances of no very definite type.

---

[1] Arlt. "Krankheiten des Auges," 1859.

[2] Coccius. "Ueber die Anwendung des Augenspiegels," Leipzig, 1853, p. 111.

[3] Ruete. "Bildliche Darstellung der Krankheiten des Menschlichen Auges." I. Band., Seite 50, Tab. iv., Fig. 3.

It will be more instructive to survey the more recent literature, not in the chronological order of publication, but according to the length of time which elapsed between the accident to the eye and the date of the patient's first visit to the reporter. The true character and significance of the ophthalmoscopic appearances will be better realised in this way.

There does not appear to exist a report of any case examined by a surgeon on the same day as the injury was received.

Stigell[1] mentions one case seen by a medical man on the day following the exposure. The patient, an astronomer, was making observations on the sun's altitude in August, 1873, wearing dark glasses. Immediately afterwards he experienced the customary after-image of the sun and a central defect in his sight persisted. On looking at a paper, at the sky, or at a bright surface, he saw a light grey misty spot before each eye, which covered the point of fixation and exhibited a slight scintillation.

His refraction and vision next day were found to be:

R. − 4D. sph. = $\frac{15}{20}$
L. − 4D. sph. = $\frac{15}{40}$ to $\frac{15}{30}$

The fundus of each eye showed nothing abnormal save a staphyloma posticum.

No scotoma could be made out, nor colour defect.

In 26 days	R. V. = $\frac{15}{15}$ nearly L. V. = $\frac{15}{20}$	with glasses.
In 57 days	R. V. = $\frac{15}{12}$ nearly L. V. = $\frac{15}{15}$,,	,, ,,

This patient, even ten years later, was occasionally conscious of a small dark spot on looking at a bright surface.

Two days after the eclipse of May 17, 1882, one case was seen by Sulzer, another by Haab, and a third by Stigell.

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[1] Stigell. "Ueber Blendung der Netzhaut." Strasburg, 1883, p. 18, Case VI.

In Sulzer's,[1] both eyes of a woman, aged 31, were slightly affected. Refraction emmetropic.

R. V. = $\frac{5}{6}$ slowly. L. V. = $\frac{5}{6}$ —1 slowly.

Ophthalmoscopic Examination.—The right optic disc appeared a little reddened. The right fovea centralis exhibited a dull yellow grey tint, over a slightly raised area two or three times the size of the normal fovea, surrounded by a somewhat broader deep, dull blue pigment border. The appearance of the left macula lutea was similar to the right, but the central foveal area was smaller and less sharply defined. Two minute bright points were also found with pigment around, the one about one mm. above, the other as far below the central area.

Dark glasses and rest were ordered.

On the eighth day the right fovea appeared as a pale yellow point, surrounded by a broad dull brown very thick pigment border. The left was similar, and the lower of the two glistening points had vanished, the upper was still present. On the seventeenth day each eye had normal vision. Six months later no defect could be detected in reading the finest print with either eye, all the letters seemed equally clear, and nothing abnormal could be seen at the macula.

In Haab's[2] patient the right eye only had been used, and was found to have

R. V. = $\frac{1}{3}$. L. V. = $\frac{5}{6}$.

Haab appears to have been the first to call attention to a peculiar sensation of oscillation or rotating movement in the central scotoma, more marked the brighter the surface looked at, but scarcely noticed or not seen at all in the dark. He offered no explanation of the phenomenon.

On the tenth day after the accident this patient had regained R. V. = $\frac{5}{6}$, but the movement within the scotoma was still very annoying.

Ophthalmoscopic Examination.—Nothing abnormal save a slight enlargement and change of shape of the foveal reflex and a somewhat stronger saturation of the immediately surrounding retinal pigment.

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[1] Sulzer. "Klin. Monatsbl. f. Augenh," 1883, p. 133, Case I.

[2] Haab. "Correspondenz-Blatt f. Schweizer Aerzte." 1882, pp. 383-6.

In Stigell's[1] case, a medical student complained of a small positive scotoma of oval form occupying the point of fixation of his right eye, and subtending an area 4.5 mm. high and of rather less breadth at half a metre distance. He was also conscious of an undulating and vibrating movement in the inner half of the scotoma. He described the appearance as though a fluid flowed very swiftly out of separate very fine radiating vessels, and the vessels themselves were thereby set in very rapid rotation around the centre of the spot. The peripheral field of vision was intact. The refraction emmetropic.

R. V. $= \frac{6}{9}$. L. V. Normal.

The right fovea showed a sharply-defined shining clear round spot, surrounded by a dull red area. The left fovea was scarcely perceptible.

Treatment.—Dark glasses and rest.

Slight improvement followed, and after a month the patient resumed work, though still conscious of the defect.

After six weeks no important change in the appearance of the fundus could be detected.

A year later the vision seemed to be nearly normal for test type, but the vibrating movement was still present, and on looking at a bright surface was more evident than the scotoma itself.

Three days after the same eclipse Haab[2] saw another patient whose right eye only had been used, R. V. $= \frac{1}{7}$, and the largest type could not be read.

On the tenth day after the accident, R. V. $= \frac{1}{2}$, unpleasant oscillating movement was still present in the scotoma, and the ophthalmoscopic appearances were as already described in his other patient.

The four following cases were seen on the fourth day after exposure :—

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[1] Stigell. *Loc. cit.*, p. 14, Case I.

[2] Haab. *Loc. cit.*, p. 386.

Dufour[1] (who states that he had seen seven or eight previous cases, four of them after an eclipse on March 6, 1867), saw a shepherd (26) who had watched the eclipse of July 19, 1879, and had since observed a bluish-grey ball of mist before his right eye. (L. eye congenitally amblyopic and squinting.) R. V. $= \frac{1}{20}$, and that probably by eccentric fixation.

Ophthalmoscopic Examination.—A slight veiling of the smaller retinal vessels between the disc and macula, and around, though not over, the optic nerve. A sharply-defined white spot occupying the fovea, the surrounding macular region of a deep red-brown, gradually fading into the normal retinal tint. Treated with dry cupping behind the ear and kept in a dark room.

By the seventh day the veiling of the retina was gone. On the ninth the white spot had become the colour of chamois leather; on the twelfth, both it and the deep red areola were scarcely perceptible.

To Dufour appears to belong the credit of first measuring the dimensions of the minute central scotoma. At a distance of 3.32 metres he found that in this case it subtended an area 30 mm. in height and 70 mm. in breadth, which corresponds with a retinal lesion 0.1 mm. in height and 0.25 mm. in breadth.

The insensibility to colours appeared absolute at the centre of the scotoma, profoundest throughout for red, and least for ultramarine blue.

On the twenty-fourth day R. V. $= \frac{1}{7}$ rising to $\frac{1}{2}$ if he looked at the foot of the letter.

More than a month later there was no further improvement. There was a slight brown tint at the macula which might have passed for normal.

Deutschmann[2] saw two young men four days after the eclipse of May 17, 1882. The one, aged 24, had noticed the defect in his L. eye immediately after his observation of the sun, and said it had undergone no further change prior to his visit. His R. eye had been long amblyopic and divergent, with corneal nebulæ.

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[1] Dufour. "Bull. de la Société Médicale de la Suisse romande," 1879, p. 321, with 2 plates.

[2] Deutschmann. *Archiv. f. Oph.*, Bd. xxviii., 3 Abth., 244. Case III.

L. V. = $\frac{20}{50}$—$\frac{20}{40}$. J. 1 slowly.

Peripheral vision good. A central partial scotoma was found, and at one metre distance had a diameter of about 15 mm. A small white pellet looked pale, but did not disappear in it. Colours were not perceived. Shaking the head seemed to bring out the defect better.

Ophthalmoscopic Examination.—A small clear spot was found at the fovea with a red area around.

One week[1] later V. unchanged, but a delicate yellow ring had appeared around the blood-red zone, being broadest upwards and inwards. The patient was admitted, and treated with diaphoretics in a dark room.

Seventeen days later the macula was recovering, and the scotoma had shrunk to 6 mm. in diameter at one metre's distance. Five months from the onset V. = $\frac{20}{30}$, no visible pathological change at the macula, and scarcely any scotoma present.

The other patient,[2] a sergeant, aged 25, complained of a dull shimmering light floating before the R. eye, and said that it had spontaneously diminished. On closing his eye, the spot had an intrinsic movement. L. V. normal; R. V. = $\frac{20}{50}$ and J. 1 slowly. Peripheral vision good. There was found a central scotoma of 15 to 17 mm. diameter at one metre's distance in which white but no colours were recognised.

Ophthalmoscopic examination showed a small clear spot at the R. fovea, with a red border. In the L. macula an indistinct spot shading into rather grey surroundings.

A week later, the R. fovea showed a small white spot, with red border, sharply defined from its greyish surroundings. Five months later R. V. = $\frac{20}{30}$. R. macula quite like L., but a minute central scotoma still present.

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[1] I have ventured to correct what I think must be evidently a printer's error in Deutschmann's report of this date.

[2] Deutschmann. *Loc. cit.* Case IV., p. 245.

Stigell[1] is the reporter of the fourth case, which affected (after the eclipse of May 17, 1882) the left eye of a young man, aged 20. His right eye was previously amblyopic. He complained of a grey, almost circular, spot in the centre of his R. field of vision.

R. V. = fingers at 8 feet and J. 15.
L. Emmetropic V. = $\frac{6}{18}$ and J. 3, slowly.

Ophthalmoscopic Examination.—The left fovea showed "a circular, yellow spot, of the diameter of a retinal vein, sharply contrasting with the dark macula around." Dark glasses and rest were ordered.

Four days later, scarcely any abnormality was visible at the macula, though the vision remained as before. By the 18th day V. = $\frac{6}{9}$, and the patient still saw a slight, grey mist floating over any object fixed. No further note.

Six days after the eclipse of May 17, 1882, Stigell[2] saw a man, aged 23.

R. Em. V. = $\frac{6}{18}$. L. Em. V. = Normal.

He failed to find a scotoma.

Ophthalmoscopic Examination. — R. fovea more sharply defined from surrounding macula than the L.

No other difference detected.

Treated by dark glasses and rest.

Four days later, R. V. = $\frac{6}{9}$, and four weeks from the onset, was $\frac{6}{6}$, while the two maculæ appeared identical.

Eight days after the same eclipse, he saw another man,[3] aged 27, complaining of "defective sight."

R. Em. V. = Normal. L. Em. V. = $\frac{6}{9}$

He failed to find a scotoma, or any ophthalmoscopic difference between the maculæ. On examining the patient two months later, he found his sight quite restored.

Nine days after the same eclipse, a girl, aged 14, came to Sulzer,[4] complaining that she had since suffered from a

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[1] Stigell. *Loc. cit.*, Case II., p. 16.
[2] Stigell. *Loc. cit.*, Case III., p. 17.
[3] Stigell. *Loc. cit.*, Case IV., p. 17.
[4] Sulzer. *Loc. cit.*, Case II., p. 134.

"luminous disc" and then a "grey spot" before her R. eye. A small positive central scotoma was found.

L. Em. V. = Normal. R. Em. V. = $\frac{20}{30}$ to $\frac{20}{20}$ slowly, and with difficulty.

Ophthalmoscopic Examination.—In the R. a stronger reflex from the fovea, and dull red pigment around, which was not present in L.

Six months later, V. was practically the same. The part surrounding the fovea in the R. macula was still duller than in the L., but scarcely noteworthy.

Ten days after the eclipse of June 17, 1890, a girl, aged 18, consulted Bock[1] on account of a dark spot in front of each eye, she having watched the eclipse with each eye alternately. In the first hours after the observation, "she could see nothing and had severe headache."

V. = $\frac{6}{12}$ slowly with each, and with eccentric fixation. No scotoma was mapped out.

She could distinguish between light colours, but not dark ones.

Pupillary reactions prompt.

Ophthalmoscopic Examination.—In both eyes the region which, in young people, is commonly encircled by the macular halo, presented a dull brown-red colour.

A month later, the visual acuteness and fundi appeared normal, but she still complained of an occasional re-appearance of the scotoma.

Eleven days after the eclipse of May 17, 1882, a man, aged 40, was seen by Deutschmann.[2] With his L. eye he had repeatedly looked at the sun through a single or double dull glass. The result had been a slight visual defect, in the form of a dim ring, open below, and a little eccentric to the fixation point. A slight defect was present also within the ring; so that he could not read small print easily.

R. V. with —1.75D. sph. = $\frac{20}{30}$.
L. V. ,, ,, = $\frac{20}{50}$.

Owing to unsteadiness of fixation on the patient's part, the position of the ring varied, but at one metre's distance, seemed to be about 10 to 15 mm. distant upwards from the fixing point.

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[1] Bock. *Centralbl. f. Augenh.*, 1890, p. 291.

[2] Deutschmann. *Loc. cit.*, p. 243, Case II.

Ophthalmoscopic Examination.—At the L. fovea, a small, bright spot, larger and plainer than in the R. eye, surrounded by a blood-red ring, shading off into a duller brown zone, which in turn merged into the general tint of the fundus. The R. fovea showed a very small, bright spot of duller colour than the surrounding background of the eye, which was about half the size of the L., and exhibited no red area.

Patient not seen again.

Fourteen days after the same eclipse a man, aged 39, came to Stigell[1] complaining of a "grey mist" before his L. eye, R. Em. V. normal. L. Em. V. $\frac{20}{50}$. Neither scotoma nor ophthalmoscopic changes were found, and the patient was not seen again.

Swanzy[2] saw a gentleman aged 45, who, FOURTEEN DAYS previously had been induced, while driving, to look with his R. eye at the sun several times on December 14, 1882, the day previous to the transit of Venus. He had since noticed on closing his eye a "flickering light, like the flame of a candle, coming from the lower part of his field and passing upward until it disappeared out of sight above," and on opening it, "a black spot before the eyes." He had also metamorphopsia. "The spot of any long straight object, such as a walking stick, etc., upon which he fixes his gaze, becomes bulged, or swelled out, but not otherwise distorted." R. Em. V. previously normal, now $\frac{6}{18}$.

With correction of presbyopia read J. 1 with slightly eccentric fixation, looking in advance of the word to be read.

No ophthalmoscopic abnormality could be found, and an attempt to map out the scotoma failed. He was treated by hypodermic injections of strychnia, and the continuous current locally, and Swanzy thinks it did some good because, though not regularly applied, V. $\frac{6}{12}$ or $\frac{6}{9}$ (?) twenty days later. When next seen, three months later, he could read $\frac{6}{12}$ centrally, $\frac{6}{6}$ eccentrically, had still metamorphopsia, and a flickering after image on closing his eye.

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[1] Stigell. *Loc. cit.*, Case V., p. 18.

[2] Swanzy, OPH. REVIEW, 1883, p. 142, Case I.

Eighteen days after the eclipse of June 17, 1890, a man of 36, and a boy of 12, came to Bock.[1] Each had watched it with his unprotected right eye, the former only for 10 minutes, the latter throughout its course. Their symptoms corresponded to those of the girl already recorded (See p. 15).

Man R. V. = $\frac{6}{36}$. L. V. = $\frac{6}{6}$.
Boy R. V. = $\frac{6}{24}$. L. V. = $\frac{6}{6}$.

The boy's scotoma was estimated to have a diameter of about 5 cm. at 50 cm. distance. "Their power of distinguishing colours was *nil*, for all colours seemed to them covered with brown." Pupillary reaction was tardy in the man's R. eye, but prompt in the boy.

Ophthalmoscopic Examination.—Normal in both. A fortnight later the man's R. V. = $\frac{6}{18}$; the boy's = $\frac{6}{12}$.

Three weeks after the eclipse of May 17, 1882, Sulzer[2] saw a baker, aged 23, whose R. eye had from childhood been defective. R. V. = $\frac{1}{4}$; not improved by glasses. His L. was affected by the sun. It was hypermetropic (+ 1D. sph.) and obtained V = $\frac{1}{2}$.

Ophthalmoscopic Examination.—The L. fovea was clearly visible as a yellow white spot, with surrounding dull red area. Numerous fine distended sinuous vessels could be traced into the macular region. The R. fovea was scarcely perceptible, and showed no special pigmentation.

A youth, aged 17, consulted Snell[3] six weeks after receiving the full blaze of the sun on his right eye while adjusting a telescope. He complained of "a dot, about the size of a fairly big pin's head, with a faint line running on either side of it."

R. myopia, with —1.5D. sph. V. = $\frac{6}{6}$.

L. V. = $\frac{6}{6}$. No ophthalmoscopic change could be found, nor could the scotoma be mapped out, but there was metamorphopsia, *e.g.*, the part of a pencil looked at appeared thicker.

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[1] Bock. *Loc. cit.*

[2] Sulzer. *Loc. cit.*, p. 135, Case III.

[3] Snell, OPH. REVIEW, 1884, p. 72.

Six weeks after the eclipse of May 17, 1882, a girl of 15 came to Emmert.[1] She had watched it with both eyes, and immediately thereafter noticed a limited dull spot before each eye, which had persisted until the date of her visit.

R. V. $= \frac{20}{100}$. With a correcting glass V. $\frac{20}{70}$
L. V. $= \frac{20}{30}$. Not improved with glass.

Her R. eye had always been a little weaker, and was a little more prominent. At 12ft. distance the scotoma in the right eye was found to have a diameter of about 15 mm. In the L. it measured about 22 mm. These dimensions correspond to retinal lesions of R 0.06 mm. and L 0.09 mm., respectively. Neither objects nor colours could be perceived in this area. Peripheral fields good, and pupillary reactions normal.

Ophthalmoscopic Examination.—Negative.

The patient complained of an unpleasant oscillation before each eye.

Treatment.—After one application of a weak continuous current, the vision on the following day was :—

R. V. $= \frac{20}{100}$ or $\frac{20}{70}$ — $\frac{20}{50}$
L. V. $= \frac{20}{30}$ — $\frac{20}{20}$

The scotoma appeared unchanged, and no further improvement took place so far as known, the patient being removed in a few days by her father.

Seven and a half weeks after having observed the eclipse of May 17, 1882, with his naked right eye, a youth of 17 came to Deutschmann,[2] complaining of a small spot which had since annoyed him by obscuring some letters of every word he read.

At four metres' distance the scotoma was found to measure about two cm. in diameter.

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[1] Emmert. *Revue Médicale de la Suisse romande*, 1882, p. 395.

[2] Deutschmann. *Loc. cit.*, Case I., p. 242.

R. V. = $\frac{20}{30}$, with some faults and No. 1 Jaeger.
L. V. = $\frac{20}{20}$ nearly.

Ophthalmoscopic Examination.—But for careful comparison of the two eyes, nothing abnormal would have been noted. Each presented a well-marked halo round the macula. At the fovea in each was a small round brown-red spot, with scarcely any sign of a clear point at its centre. The only difference appeared to be that in the left eye the spot was smaller, and did not exhibit a little light reflection which was present in the other. The patient was not seen again.

Eight weeks after the same eclipse a man (32) came to Sulzer[1] complaining of the consequences to his right eye.

While shooting, four days after the event, he noticed that a "grey curtain" obscured all but the four corners of a target three metres high by two metres broad, at 400 metres' distance. It had persisted and become denser.

L. Em. V. = Normal.
R. Em. V. = $\frac{1}{4} - \frac{1}{3}$.

A positive central scotoma was found, measuring 7 mm. by 3 mm. at 30 cm. distance, having its lower border notched.

Ophthalmoscopic Examination.—The right macula showed a grey-yellow spot about the size of the optic disc, somewhat flattened above, surrounded by a dull brown pigmented area, which occupied the rest of the macula. Fundus otherwise normal.

The left macula showed no special pigmentation.

Treatment.—Dark glasses and strychnine injections.

Six months later R. V. = $\frac{1}{3} - \frac{1}{2}$.

Central scotoma smaller, but still present, and at the centre of the macula a dark brown pigment spot about one-third of the size of the optic papilla with a normal reflex from the fovea at its centre.

About four months after the occurrence Swanzy[2] had an opportunity of examining the coachman, aged 23, who had been driving the carriage of his other patient under the circumstancesabove-mentioned (see p. 16), and had made more continuous observations than his master with his unprotected R. eye. He had no after-image on closing his eye, but complained of blurring of any distant object steadily fixed, and of metamorphopsia.

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[1] Sulzer. *Loc. cit.*, p. 135, Case IV.

[2] Swanzy. *Loc. cit.*, Case II.

A small central scotoma, measuring about 6 mm. in diameter at 65 cm. distance, was found, and a walking-stick held perpendicularly before the eye at 4 metres' distance appeared swollen out to nearly three times its natural thickness at the part fixed, the node appearing about 10 cm. long.

Ophthalmoscopic Examination.—" A dense red spot, very similar to, but decidedly larger than the appearance found there normally, and much larger than the normal appearance in patient's left eye. The central whitish spot was not present, although it may have been so at an earlier period."

Of some cases seen by Dufour[1] after the eclipse of May 17, 1882, the sole record appears to be—

" They are analogous to the one previously described in 1879. While the anatomical changes were not very characteristic, the functional troubles were graver. In one case V. = $\frac{1}{20}$. The treatment consisted in darkness and strychnia hypodermically."

Reich[2] saw a case with V. = $\frac{1}{4}$. Macula darker than normal.

(*To be continued.*)

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[1] Dufour. *Rev. Méd. de la Suisse romande*, 1882, p. 380.

[2] Reich. "Wratsch," Nro. 45, see Nagel's "Jahrsbericht f. Ophth.," 1884, s. 401.

NOTE ON THE ROD TEST.

By Edward Jackson.

The statement made on p. 228, vol. xii., that two or more rods placed side by side, as suggested by Mr. Maddox, (p. 38 of this volume), "gives not a continuous line, but a series of short lines, together constituting a broken line," and the note of doubt as to its correctness, require explanation.

If such a series of rods be so held that but a single rod is before the pupil at a time, that rod will give a continuous line of light throughout nearly its whole breadth, and if it be held very close to the eye, throughout its whole *apparent* breadth, will be sufficient to give a continuous line of light of considerable length. Where the sides of two rods come together, however, there will be a break in the continuity of the line, unless this be avoided in the manner to be presently referred to. Such a break is due to the fact that near the sides of the rod the light is totally reflected within it. As the rods are held farther from the eye, the line corresponding to each rod becomes shorter, more of these lines are seen at once, and more of the breaks separating them. Only when the series of rods is held some distance from the eye, perhaps, is the statement justified that we have a series of short lines, together constituting a broken line.

The instrument referred to, however, was designed to be placed in the front groove of the trial frame, or held even farther from the eye in a separate handle, so that with it a noticeable interruption of the line of light would occur if such a series of rods were used.

If the rods, instead of being placed exactly in contact be separated from each other by very slight intervals, the eye will perceive, on looking through them, a reflection from the adjoining surfaces of the rods ; and this, with the light as seen directly in the crevice between the rods, may under some circumstances give the effect of a continuous line, but such an arrangement would be worthless as a test for heterophoria. Again, by holding the rods, so that the plane passing through their centres is not perpendicular to the visual axis, but is inclined to that axis at an angle of less than 70°, the margins of the rods will over-lap sufficiently to cover the break in the line and thus give a continuous line. This also is impracticable when the test is used in a trial frame. Only under some such conditions can I conceive that a careful observer would fail to notice the break in the continuity of the line corresponding to the point of contact of two adjoining rods.

R. GREEF (Frankfurt a. M.). **Observations on the Interchange of the Fluids in the Eye, and the Occurrence of Fibrin in the Aqueous Humour.** *Report of the Heidelberg Ophthalmological Society for* 1893, p. 11.

When the cornea of a rabbit is punctured, the aqueous fluid which escapes is clear, free from fibrinous coagulation even after long standing, and contains only an imponderable amount of albumin—practically no albumin. If the same eye is punctured again a few minutes later when the aqueous chamber has refilled, the fluid obtained coagulates readily, is rich in albumin, and under the microscope shows a multitude of fibrin filaments. In seeking the source and mode of this fibrin production, Greef has made some new and interesting observations.

The eyes of rabbits were removed at various intervals after a corneal puncture, hardened, and microscopically examined with the following results. Immediately after the evacuation of the anterior chamber the epithelial covering of the ciliary processes is raised from its bed in the form of numerous small vesicles. These are so numerous as to be found in every microscopic section taken from this region, and they are visible with quite a low magnifying power. They are not equally distributed over the whole of the ciliary processes, but are found chiefly on the middle and anterior parts of each process, where the epithelial cells are comparatively flat, and are less developed near the base of the processes where the cells are typically cylindrical. The vesicles or blisters are filled with a highly albuminous exudation, coagulated by the hardening fluid, like that which fills the chamber after the primary evacuation. The vesicles rapidly become larger and ultimately burst, discharging their contents into the posterior aqueous chamber. It is not so easy to decide exactly how recovery takes place, but it appears that the ruptured vesicle does not, as a rule, suffer destruction, but re-applies itself to the underlying surface. In addition to this disturbance of the epithelium, the ciliary processes show an extreme degree of hyperæmia, and sometimes diapedesis and small hæmorrhages in their stroma.

On this observation Greef remarks as follows:—It is probable that such epithelial separation occurs after every evacuation of the chamber, *e.g.*, after cataract extraction, and opens the way for the irido-choroiditis which sometimes follows.

The lesion of the epithelium is clearly due to the removal of the pressure from its outer surface, whereby it is rendered unable to withstand the pressure from the capillary plexus on its inner surface, or to perform its function of keeping back the various constituents which are present in the blood, but which are absent from the normal aqueous humour. The distribution of the vesicles over the whole of the ciliary processes, and their absence from the iris excepting in those places where the processes extend along its posterior surface, confirm the well-established fact that the ciliary body secretes the aqueous humour. Incidentally the author raises some objection to the use of the term "glands of the aqueous humour" (Nicati, Treacher Collins), and prefers the expression "secreting surface," for it appears that the whole of the surface is concerned, and that the gland-like arrangement of the cells which is especially observable near the base of the processes (Treacher Collins) represents simply an infolding of the surface for the production of an increased secreting area. The question is, however, merely one of terms.

In the discussion which followed, Greef's observations were fully confirmed by Leber, who pointed out, however, that the presence of albuminous and fibrinous constituents in the aqueous humour need not, under all circumstances, be attributed to actual lesions of the epithelium. According to our present knowledge an abnormal difference of pressure on the two surfaces of the epithelium will account for an abnormal escape of constituents from the blood.

P. S.

M. KNIES (Freiburg). On a New Treatment of Glaucoma. *Report of the Heidelberg Ophthalmological Society for* 1893, *p.* 118.

It is generally recognised that the efficacy of a glaucoma iridectomy depends essentially upon the corneo-scleral incision, and that the removal of a portion of the iris is necessary only for the prevention of subsequent complications. Knies proposes to obtain the full advantage of the latter step, without its disadvantages, by cutting through the base of the iris with the knife in making the corneo-scleral incision, thus producing an operative partial iridodialysis.

In a case of annular posterior synechia with bulging iris, he found it impossible to pass the Graefe knife between iris and cornea, and consequently transfixed the bulging iris and cut through it in making his incision. An iridectomy was then found to be impracticable. The result was as good as though a typical iridectomy had been made.

A good result was obtained by the same proceeding in a case of primary acute glaucoma. The patient had very acute glaucoma in both eyes, with almost complete blindness of four days' duration. In the left eye, which had suffered no premonitory symptoms before the present attack, Knies did an ordinary iridectomy. In the right, which had suffered premonitions for twelve months, the chamber was very shallow, and the Graefe knife, in making the puncture in the sclera, punctured the iris also. He thereupon completed the incision, dividing the iris base at the same time. The result was good in both eyes, the right recovering even more quickly than the left. Six months later both eyes had useful vision and no excavation. Three years after the operation the iridectomised eye suffered a fresh glaucomatous attack, while the other remained quiet, with the same vision as before.

On the strength of these two good results—it does not appear that at the time of speaking the number had been increased—Knies recommends this new operation, which he calls irido-sclerotomy, as a substitute for iridectomy in glaucoma. He claims for it that it establishes under all circumstances a communication between the posterior aqueous chamber and the filtration angle, the peripheral stump of iris being too short to overlap both lips of the incision. It acts like a perfect iridectomy without the danger of prolapse or incarceration of the iris and cystoid cicatrix. It should be performed with the aid of eserine, and by means of the Graefe knife. It should be done slowly, so as to avoid a sudden escape of the aqueous. The incision need not be completed, but a bridge of sclera or of conjunctiva only may be left, provided always that it lies well at the periphery, and cuts through the iris at its insertion. In case of need it may be repeated. The following caution is given : " The operation is not quite easy, because the lens and zonula must not be wounded. But in a glaucomatous attack the conditions in this respect are particularly favourable, for the anterior chamber is shallow, and —at first at least—the lens is not pushed forward to a corresponding extent."

We would draw particular attention to this quotation. The suggested danger is certainly most important, and it appears to us that the supposed security is fallacious. In the secondary glaucoma following annular posterior synechia the iris is bulged forward away from the lens, and the conditions are very favourable for the irido-sclerotomy. In such a case the present writer has obtained an excellent result just in the manner described by Knies. But in primary glaucoma the advance of the iris *depends upon the position of the lens*, and as may be well seen in some of the published drawings of this condition, the margin of the lens is in unusually close proximity to the iris base. In a typical case of this kind any attempt to pass the point of the knife behind the base of the iris, instead of in front of it, must place the ciliary processes and lens in great peril. To act upon the author's statement, that the lens in such a case is not pushed forward, but holds a particularly favourable position for an irido-sclerotomy, would be very likely to lead to disaster. P. S.

E. RAEHLMANN (Dorpat). Detachment of the Retina. *Reviewed in Centralblatt für praktische Augenheilkunde, Nov.*, 1893.

This article, which appeared in the *Archiv. für Augenheilkunde*, vol. xxvii., is a criticism by Raehlmann of Leber's views of the etiology of detachment of the retina, and an argument in favour of the diffusion theory. Raehlmann considers detachment of the retina to be due to exudation from the vessels of the choroid; but since, in the closed sac formed by the globe, there is no space for such a new exudation to take place, and the tension, raised by such an extravasation, would of itself prevent any increase, this explanation is only feasible in cases in which the contents of the globe are correspondingly diminished. But we have the necessary conditions for increase if the exudation—the serous fluid from the choroidal vessels—can be interdiffused with the liquefied vitreous humour, which in cases of spontaneous detachment of the retina is always abnormally fluid. Diffusion takes place through the retina, according to the ordinary physical law; the fluid behind the retina, being highly albuminous, passing into the vitreous cavity; while the fluid from the vitreous, being less albuminous, passes through the retina in greater quantity, and produces a larger and larger detachment. This theory readily explains the mechanism of detachment which other theories, notably, that of Leber and Nordenson, conspicuously fail to do. The Leber-Nordenson theory is that a shrinking of the vitreous takes place. the retina being torn, and fluid, expressed from the vitreous humour, passes through the aperture behind the retina, where it collects. But it is not easy to determine whether this shrinking of the vitreous, which Leber found in all cases, may not rather be subsequent in origin to the detachment; and it is important in this connection to note that one of these conditions may be present without the other. The two must, therefore, be to some extent, at all events, independent. No doubt a shrinking vitreous may "peel off" the retina from its attachments, but detachment of this class is quite different in aspect from the typical *amotio retinæ*. There is not the rounded, bladder-like bellying forwards of the membrane, which rather appears folded on itself and wrinkled; and, besides, one frequently sees detachment when the vitreous has not shrunk at all, but as a matter of fact has become completely liquefied. The cases examined by Leber and Nordenson were not at all suitable for settling the point, inasmuch as they were of varying age; but, at all events, the vitreous humour was more shrunken the older the case, and in once instance of a recent character, shrinking was conspicuous by its absence. By injection of salt solution, and by introduction of metallic substances into the vitreous, Leber succeeded in experimentally producing shrinking of the vitreous, and laceration and detachment of the retina. Similar experiments on dead eyes produced analogous changes without detachment. Raehlmann has repeated these experiments on living animals, and succeeded in producing detachment of retina without any laceration of the membrane. Any shrinking of the vitreous there was, was only proportionate to the encroachment of the retina upon the vitreous chamber. Repeating the experiments on dead eyes he found no changes at all.

The difference between the results on living and on dead eyes is explained by Leber as being due to *post-mortem* changes—by Raehlmann as due to the absence of any albuminous solution capable of setting up dialysis. In order to prove his contention, Raehlmann modified the experiment so far as to prepare a small aperture in the sclerotic, and then laid the eyes, after the injection of a salt solution or the introduction of a metallic foreign body, in an albuminous fluid. Out of twelve eyes into which he had introduced foreign bodies, he succeeded only a very few times, and then after long immersion in the solution of albumin, in producing a flat detachment; but in the dozen cases into which he had injected salt solution he found in several instances after quite a short stay in the albuminous fluid, a typical rounded, bulging detachment of the retina.

That a rent in the retina is not a *sine quâ non* is certain, for in many cases it is not to be found. Agreeably to the law of diffusion through a membrane, more of the watery fluid passes behind the retina than albuminous fluid passes to the front of it—a fact which accounts for the bladder-like form of the detachment. When the tension of fluid behind the retina rises considerably higher than that in front, the membrane gives way, and the lips of the rent are naturally directed into the vitreous, but the existence or not of a laceration depends on the resisting power of the retina, as well as on the tensions of fluids. Leber's theory demands also that there shall be a posterior detachment of the vitreous, and that the fluid shall be squeezed in through the rent in the retina; but why should this take place? The rounded bleb formation is also difficult to explain on this theory. Further, the vitreous shrinking as a whole might cause a general detachment, but could a localised detachment be produced by "cicatrising bands" in the vitreous? Again, Leber's theory demands a certain adhesion of vitreous to retina, else why should the retina follow a shrinking vitreous; but this is negatived by the posterior separation of the vitreous, which is also a requisite. If the same fluid existed in front of and behind the retina, it must have the same specific gravity, and there would therefore be no reason why the detaching fluid should sink to the lowest part; but this does take place as a matter of fact almost always, from which it follows that the two fluids are not of the same specific gravity, and therefore are not identical. The peculiar greenish or bluish hue seen in the area of detachment is due to the tint of the fluid behind the retina, which for this additional reason also must differ from that in front. This tint is not due to any change in the membrane itself, for when Raehlmann removed this fluid by means of a hypodermic syringe and re-examined the eye, the retina thus replaced showed no difference from the normal. This fluid, on chemical examination, proved to contain a large proportion of albumin, a fact which is also shown by its becoming coagulated when such an eye is placed in any preservative solution, while that in the vitreous cavity remains clear. Raehlmann found a peculiar system of spaces in which he recognises the path by which diffusion takes place. Spontaneous cure of *amotio retinæ*, inexplicable on Leber's theory, may arise, provided the sub-retinal fluid is absorbed. Raehlmann recognises in detachment of retina an analogy with œdema and transudations in other parts of the body, particularly in serous cavities. In persons liable to œdema—*e.g.*, those suffering from Bright's disease—detachment of retina is more often observed than among those in health, and is more liable to be bilateral.

W. G. SYM.

HENRY M. CHASSEAUD (Edinburgh). Intraocular Therapeutics: an Experimental Study.

Jour. of Pathology and Bacteriology, November, 1893.

This paper opens with an historical retrospect, dealing chiefly with the records of intraocular injections in cases of detachment of the retina. The objects of the experiments undertaken by the author were (1) To determine how far intraocular injection of various substances is possible; (2) To test the antiseptic value of these substances in the vitreous chamber; (3) To ascertain if, in cases of detachment of the retina, re-absorption of the sub-retinal fluid with consequent re-apposition of the retina to the choroid can be brought about. The ophthalmoscopic and microscopic changes produced by the different substances injected are also described.

Rabbits were employed in all the experiments, and the author describes his apparatus and method in detail. The quantity injected was usually 2 to 4 cubic millimetres.

As all antiseptic substances are more or less irritant in nature, they tend when injected into the vitreous to produce an adhesive retinitis, which will vary in intensity according to the irritating properties of the injection. The vehicle for the injection should be one which will not of itself produce any irritation. Those employed by Chasseaud were sterilised blood serum and distilled water, which, as shown by experiment, are entirely passive in their action, when introduced aseptically into the vitreous.

The substances injected included alcohol 30 per cent. solution, carbolic acid 1 in 50, corrosive sublimate 1 in 5,000 and 1 in 1,000, pyoktannin 1 in 5,000, camphorated naphthol, iodoform in glycerine 10 per cent., boric acid 10 per cent., peroxide of hydrogen, creolin 1 per cent., eucalyptol, oxycyanide of mercury 1 in 500, chlorine water, tincture of iodine, iodised serum.

The author gives a careful description of the changes in the ocular tissues brought about by these different antiseptics; and also, in many instances, their effect upon suppuration of the vitreous induced by the subsequent injection of *staphylococcus pyogenes aureus.* These details we cannot give at length; to those interested in the subject Dr. Chasseaud's paper is worth careful perusal. The following summary of results is in the author's own words. He concludes from his experiments:—

(1) That various fluids may be introduced with safety into the posterior chamber of the eye.

(2) That chlorine water is the only substance which fulfils the necessary conditions for a useful intraocular antiseptic. Its action is efficient and it causes practically no inflammatory reaction.

(3) In regard to the other antiseptics tested, corrosive sublimate and carbolic acid, owing to their stable compounds with albumin and the inflammatory reaction which they produce, are not so useful as some others which are less active. Tincture of iodine, camphorated naphthol, hydro-naphthol, eucalyptol, and other antiseptic oils are far too violent in their action and cause disorganisation of the eye. Boric acid and iodoform are weak and non-irritant antiseptics. Oxycyanide of mercury and peroxide of hydrogen are just as good antiseptics as chlorine, but the former causes opacities in the vitreous, and the latter seems to bleach the pigment of the eye. Creolin is a powerful irritant, and its antiseptic action is very doubtful. Pyoktannin does not act as an antiseptic in the vitreous: it gives rise to neuritis with subsequent degeneration and atrophy of the optic nerve.

(4) The idea of causing a localised adhesion of the retina to the choroid, by inducing a moderate degree of inflammation in the former, has not been very successful in practice. Slight degrees of retinitis can easily be produced. They are usually accompanied by a sub-retinal effusion. When this effusion becomes absorbed, adhesion between the retina and choroid never ensues in rabbits. In severe forms of retinitis caused by powerful irritants, we certainly get adhesion of the retina to the choroid, but with complete disorganisation of the former, extending for a considerable distance from the point of injection.

(5) In all forms of inflammation of the retina, the nerve-

cell layer is the first affected and suffers most. The external granule layer is the last to disappear. None of the seven layers are ever reproduced when once they have been destroyed.

(6) Although the *staphylococcus pyogenes aureus* was injecied into the vitreous over fifty times, in no case did sympathetic inflammation affect the opposite eye, so long as the latter had not been the seat of a recent inflammation, or had not been injured subsequently.

(7) It must be borne in mind that all these experiments were performed on rabbits. In these animals the regeneration of the vitreous is wonderfully rapid, and persistent glaucoma leading to disorganisation of the eye seldom, if ever, occurs. How far these results may be applicable to man it would be difficult to say.

A useful bibliography is appended to Dr. Chasseaud's paper; and a series of drawings of ophthalmoscopic and microscopic appearances of the eyes experimented upon.

J. B. L.

HESS (Leipzig). Clinical and Anatomical Studies on Filamentary Keratitis and some Allied Affections of the Cornea. *V. Graefe's Archiv. f. Ophth., xxxix.,* 2.

NUEL (Liege). Filamentary Keratitis. *Archives d'Ophtal., Oct.,* 1893.

In his second contribution to the knowledge of filamentary keratitis Hess brings a large amount of new material forward, and some very complete and convincing anatomical observations on the nature and mode of origin of corneal filaments. Quite a number of other observers, among whom are Samelsohn and Leber, have come to conclusions similar to those which have been put forward by Hess and Nuel; on the other hand, the early opinions which attributed the filaments to conjunctival mucus, or to a fibrinous exudation from the cornea, have still a large body of warm supporters. There is a great similarity between the conclusions of Hess and Nuel, but the former goes further than the latter, and includes under the head of filamentary keratitis almost, if not quite, all the cases commonly known as herpes corneæ. The main results of Nuel's observations have been already given in the OPHTHALMIC REVIEW.[1]

As Hess's statistics show, corneal filaments arise mainly as the result of a lesion of the surface or deeper layers of the corneal epithelium, but they frequently occur spontaneously in the form of herpes of the cornea. Seen with the naked eye, several small clear blisters, with a large number of filaments, appear to arise from the surface of the cornea; if examined with a lens, the blisters are found to be small knob-like elevations attached to the cornea by a pedicle. One can frequently see a previously long-extended filament become coiled up by the action of the lids so that it comes to lie as a little knob close upon its corneal base; the converse of this, the unrolling of an apparent vesicle to form a filament, can frequently be seen.

The clinical course of the affection is a very varying one; in many cases a cure resulted in one or two days without further treatment, especially where the filaments appeared as the result of an injury; the herpetic forms generally resisted treatment for weeks. The most successful treatment seemed to be removal of the filaments with some of the surrounding epithelium; touching the spot with nitrate of silver had also a good influence in many cases, but in others it was inert.

For the histological examination, the filaments were removed by abrasion; the whole of the epithelial layer appeared to be less firmly attached than normally, and in some instances it came away entire, but this did not delay the healing. The specimens were first examined in normal saline solution, and afterwards hardened in picric acid, 3 % of nitric acid, Flemming's fluid, concentrated sublimate, or alcohol. The filaments consisted of a central strongly-twisted string, surrounded by a fine homogeneous or fibrillary envelope; the envelope showed a remarkable power of absorption. If one of the filaments which had been hardened in alcohol were placed under the microscope and a drop of water added, the volume of the envelope rapidly increased in size and became more transparent; the further addition of alcohol made it shrink again in a moment. The filament ended in a distinct knob, in the centre of which the form of twisted epithelial cells was very evident; its proximal end widened out like a funnel and gradually subsided into the rest of the cornea. Peculiarities in form were very constant, and it was only concluded by varying the staining reagent, and examining them in all stages of development, that they were always made up of twisted epithelial cells. The behaviour of the different component cells under colouring reagents is of great importance; the strongly twisted parts of the ropes take up hæmatoxylin very sparingly, but stain quickly with eosin, while the envelope only stains with hæmatoxylin. In places the epithelium is degenerated, and does not give a proper staining reaction, and this is the foundation for the opinion of Vossius that the filaments consist of fibrin; but the existence of epithelial elements can always be made out. It is interesting that quite similar appearances were found in the keratitis bullosa of absolute glaucoma.

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[1] See OPHTHALMIC REVIEW, Dec., 1892, and June, 1893.

Attention was specially directed to the epithelium in the neighbourhood of the filaments; it was only rarely found to be normal; more or less extensive changes of various kinds were mostly present. Large round or elliptical cells, two or three times as large as epithelial cells, frequently appeared; they were sharply contoured, in contrast with the ordinary epithelium, and stained only slightly; they contained one or two nuclei, and more rarely a mulberry-like mass of several nuclei. Other cells of similar size and appearance were found with highly refractive contents.

Some of these cells appeared to contain strongly-refracting deeply-staining masses, which possessed much similarity with the singular cell inclusions which have lately been found in various tumour cells. Groups of cells of this nature were described by Nuel in his second paper on this subject. Sometimes there were groups of cells containing a large central hyaline cell which pushed its neighbours aside, so that these latter appeared to be grouped around it; this central cell could be seen to send out processes which gave a hyaline reaction. No amyloid reaction could be obtained with any of the cells. After discission operations secondary to cataract extraction, a filament frequently appeared at the seat of the corneal puncture which appeared different from the epithelial type of filament; this did not arise from the surface of the cornea, as it remained behind when the epithelium was removed, and could only be torn off by forceps. If examined, it was found to consist of a central more or less twisted cord, surrounded by a spongy fibrillary envelope; it was less twisted than the epithelial cord, and contained leucocytes between its fibres, but no epithelial elements. It is probable that this filament was formed by a mass of vitreous which had escaped through the puncture wound; it only appears after secondary cataract operations, it has never been seen after discission of juvenile cataract where penetration of the vitreous has not been possible. Greater probability of this method of origin is afforded by one case in which the iris was wounded during the needling; a filament was found the next day attached to the site of the puncture, which contained fine-grained pigment like that existing in the pigment cells of the iris.

W. T. HOLMES SPICER.

NUEL. Hyaline and Mucoid Degeneration of the Corneal Epithelium. *Archives d'Ophtal., October,* 1893.

In his researches on filamentary keratitis, Nuel has been led to examine the corneal epithelium in a number of ocular affections with alteration of the corneal surface, and has come to the conclusion that there is too much tendency to neglect the activity of the epithelial cells in a host of processes involving the cornea ; by always looking for the microbe, we are apt to neglect everything that is not a microbe. These changes are polymorphic, and are often met with in the same cornea ; the formation of corneal filaments appears to be one of the special forms resulting from one of these changes ; for want of a better name that of hyaline degeneration has been chosen without necessarily prejudging the nature of the pathological process.

In an eye affected with absolute glaucoma, in which the cornea had been roughened and insensitive for some months, the changes were most marked. The surface cells were much flattened and in places absent, possibly having been removed mechanically ; the succeeding three or four layers of cells were normal ; beneath them the cells were found elongated and flattened, and very highly refracting, an appearance which has been frequently found accompanying filamentary keratitis. The cells beneath this layer were of normal size, but the protoplasm had lost its fibrillary character, the cells appeared to be somewhat dissociated, and contact with adjoining cells broken. The cells increased in size insensibly, and the deepest of them were like large clear vesicles, and contained drops of a clear homogeneous liquid substance ; the protoplasm was attached as a thin layer only to the cell membrane, forming a granular crescent or circle surrounding the vesicle. The deepest layer consisted of large polynuclear protoplasmic cells. These different forms are not always found in the same cornea ; sometimes one or other predominates. In all cases of this kind the cornea in the living appears to have lost its polish, and this was at first wrongly thought to be due to the inter-epithelial œdema described by Fuchs in glaucomatous eyes. The cells appear to undergo a hyaline degeneration and are associated together in the form of nests which grow in size by the increase of their constituent elements, and may present on the free surface in the form of vesicles ; the boundaries of the cells may disappear leaving lacunæ of considerable size.

W. T. Holmes Spicer.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Thursday, December 14, 1893.

D. Argyll Robertson, M.D., F.R.S.E., President, in the Chair.

Failure of Central Vision.—This paper was read by Dr. W. A. Brailey. In an otherwise healthy man, now aged 57, and of good habits of life, the left eye began to fail in 1884, and the right followed the same course in 1886. Central vision for form and colour was absolutely lost in the first eye after two years : its appreciation of form was eccentric, and was one-twelfth of the standard, and of colour one-eighth of the standard. The ophthalmoscopic changes were degeneration of the retinal pigment epithelium and chorio-capillaris, leading to darkening, scattering, and irregular distribution of the pigment epithelium and atrophy of the chorio-capillaris, so that the thickened vessels and stroma of the central and outer layers of the choroid were more visible than normal. The right eye had also an absolute central scotoma, and its vision, eccentrically, was reduced to one-eighth for form, and one-third for colour respectively. Its ophthalmoscopic changes were similar, but probably less advanced ; the area involved was smaller. The pigment was less dark and more cloudy, and formed an irregular ill-defined ring in the neighbourhood of the macula lutea.

The President said that the ophthalmoscopic changes in this case were slight when compared with the visual defect, and this he took to be an indication that the deeper and most sensitive part of the retina was affected; he did not think treatment was likely to be of any avail.

Mr. Lawford had had under his care a woman, one of whose eyes had a similar affection to the one under discussion; the choroid and retina were both affected, but it was not certain whether the affection was inflammatory or atrophic.

Mr. Tay had seen cases of this kind in young adults, which began with hyalitis; this cleared up after a time, leaving patches similar to those described by Dr. Brailey.

Mr. Silcock thought the progressive obliteration of the choroidal vessels in this case, a kind of arteritis obiliterans, was the most marked feature. He knew of no other disease which produced this progressive change except syphilis.

Some Unusual Forms of Intraocular Neoplasms.—This paper, illustrated by lantern slides, was read by Mr. Treacher Collins. The first case was a melanotic sarcoma of the ciliary body, removed from a woman, aged 63; the point of interest about it was the congenitally deeply pigmented condition of the whole uveal tract, and the presence of pigment patches in the sclerotic. The second case was a primary tumour of the ciliary body, which had a glandular structure; the patient had come under the care of Dr. Rockliffe, of Hull, in August, 1893. A tumour of the ciliary body was diagnosed, and the eye excised. The anterior part of the growth was deeply pigmented, the posterior part devoid of pigment; in the peripheral less degenerated parts of the tumour the cells were distinctly epithelial in type, and arranged in a way suggestive of a glandular structure. Referring to four other published cases of a similar nature, Mr. Collins expressed the opinion that the tumours had origin in the glands which he had demonstrated to exist in the ciliary body, at the March meeting of the Society in 1891. The next two cases were a brother and sister, each of whom had both eyes affected by a vascular new growth, probably of the nature of a capillary nævus of retinal origin. In the brother the sight began to fail at the age of 20, and progressed to absolute blindness of both eyes in the course of a year; they were excised on account of pain and tension. In the sister the sight began to fail in both eyes at the age of 10 or 11, and progressed to complete blindness in a year. Pain did not come on till thirteen years later, at which time both globes were excised. One of the brother's eyes was obtained for examination. The retina was everywhere detached, except at one spot; its veins were enormously enlarged, and their walls thickened. In the sister's eye no iris, lens, vitreous, or retina could be distinguished. They seemed to be replaced, and the cornea to be partly invaded by a new growth composed of a network of thin-walled capillary vessels; there was a large cavity in the interior of each eye, and plates of bone had formed on the inner surface of the choroid.

Congenital Trichiasis.—Mr. Sydney Stephenson showed two examples of congenital trichiasis of the lower lids in brothers, aged 6 and 7 years respectively. In the younger, both eyes were affected; in the elder, the right eye only. The misdirected cilia had produced their usual train of secondary symptoms. The author pointed out that in slight cases, the nasal third of the free edge of the lower lid was concealed by a horizontal fold of skin, which, starting from the inner canthus, ran horizontally outwards. In more marked examples, this fold might hide from view the inner two-thirds or even the entire extent of the intermarginal space. The lashes might be displaced without coming into actual contact with the eye; or they might, upon the other hand, impinge directly upon the cornea, and thereby cause considerable irritation. Congenital trichiasis was generally bilateral, but it might affect one eye to the exclusion of the other. In explanation of the condition, Mr. Stephenson suggested that the trichiasis was of mechanical origin, and depended in the first instance upon a relative malformation of the tarsus of the lower lid.

Suggestions in the Interests of the Eyesight of Children.—This paper was read by Mr. Charles Wray. He said there should be a certain relation between the strength of the eye and the duration of work, and the necessity of allowing frequent short intervals of rest should be impressed upon teachers. The question of night work was gone into, and it was pointed out that many teachers were in favour of lessening night work as much as possible. Teaching should be carried on preferably by blackboard and lantern, avoiding the use of the accommodation in reading. The increase of the myopia, or the rapid diminution of hypermetropia, were to be carefully looked for, and work discontinued for a time.

Mr. Henry Power had recently seen a boy who had been rejected by the naval authorities for defective vision. He had been working long and continuously for the entrance examination, and had passed it with success. Six weeks after the examination his sight was absolutely perfect. A certificate to that effect was given him, and the boy was eventually admitted; he narrowly escaped rejection, owing to a temporary spasm of accommodation.

Mr. Critchett thought the subject was of national importance; he had seen three cases in the past year similar to that described by Mr. Power; in one of the cases the boy had obtained a scholarship, but was rejected, because one eye fell just short of the normal; with rest, the spasm passed off, and vision again became normal, and he obtained admission to the navy.

Card Specimens.—The following card specimens were shown:—Mr. J. Grosvenor Mackinlay: Congenital Dislocation of both Lenses upwards, with marked Stretching of the Suspensory Ligament in One Eye.—Dr. Rayner D. Batten and Mr. Holmes Spicer: A Case of Pigmentary Moles of the Retina, with drawing.—Mr. John Griffith: Microscopic Section of a Cornea showing Blood Crystals.—Mr. Adams Frost: A Case of Syphilitic Conjunctivitis.—Mr. Collier Green: Orbital Exostosis.—Mr. Kenneth Scott: Drawings of Sclerosis of the Cornea, Sarcoma of the Orbit, Luxation of the Lens.—Mr. Kenneth Campbell: Case of Coloboma of the Macula.—Mr. Lang: Case of Sarcoma of Choroid.

ON BLINDING OF THE RETINA BY DIRECT SUNLIGHT. A STUDY IN PROGNOSIS.

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(*Continued from page* 20.)

PART II,

Notes of Seven New Cases of "Eclipse Blinding."

ON the morning of June 17, 1890, a partial eclipse of the sun was visible from Edinburgh. In the following week two patients consulted me on account of defective sight, induced by an imprudent study of the phenomenon.

A very partial eclipse of the sun, which took place in the afternoon of June 6, 1891, supplied the opportunity of observing five more cases.

Following the plan which I have pursued in the earlier part of this paper, I shall describe these according to the length of time which had elapsed between the exposure of the eye to the sun and the date of my first opportunity of examining each.

Case I. (Seen on the fourth day after the eclipse of June 6, 1891.)—M. M., a schoolboy, aged 15, watched the eclipse between five and six p.m. with his L. eye. He looked through a cobalt glass and also through a very dark smoked glass, but at times without any such protection. There was a faint cloud betwixt him and the sun, so that he did not feel much dazzled. Following each observation he had a temporary after-image, but it seemed to pass quite away.

He read from 7 to 9 p.m. without discomfort, but so soon as the gas was lighted at 9 p.m. he noticed a dark spot at each word he looked at, and had to stop reading.

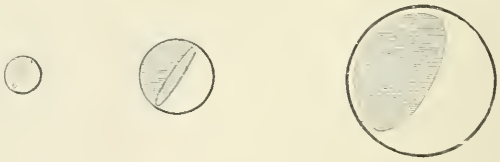
On waking next morning this was more noticeable. A spot appeared in front of him wherever he looked. It was colourless and free from oscillation or other movement. He described its appearance as something between "bright" and "grey."

On *June* 10 he came to the Royal Infirmary.

R. V. = $\frac{6}{24}$. With —2D. cyl. ax. ⟋ 145° = $\frac{6}{12}$ partly.

L. V. = $\frac{6}{9}$ partly. With —0.75D. sph. = $\frac{6}{6}$ almost perfectly, but stated that he saw each letter better when it stood to the right of his point of fixation than when looking directly at it.

When at six metres' distance he fixed with his L. eye the centre of a large A (the test for V. = $\frac{6}{60}$), its left limb and horizontal bar appeared obscured by a hazy oval spot.



5 mm. 1 cm. 2 cm.

FIG. 1.

Only a hasty examination could be made on that occasion, and no gross lesion having been discovered in the fundus he was requested to return next day.

June 11 (fifth day).—At one metre's distance his L. eye could not see any part of a white disc of less than 3 mm. diam. if directly fixed on a black surface, but as white discs of increasing size were placed before him the right and lower borders began to be well defined, then the surface adjacent to these borders became clearly visible, until upon a disc of 2 cm. diam. the whole scotoma could be projected.

Fig 1. is from his description. The dull shaded area is the projected scotoma.

It was thus found to have an oval form, a long diam. of 17 mm. and a breadth of 11 mm., to extend considerably more to the left than to the right of the point of fixation, indeed, in the latter direction, only overlapping to the extent of 1.5 mm. in the horizontal meridian.

The colour sense was perturbed over a larger area and to an apparently unequal degree for different colours. Thus a 2 mm. disc of red or of yellow was invisible at the centre of the field, but the former came into view when held at 3 mm., the latter, not until 6 mm. to the right of the point of fixation. The defect was not uniform within the scotoma, but seemed most profound over a small area to the left and upwards from the point of fixation, where all 2 mm. discs of colours were invisible.

Ophthalmoscopic examination confirmed the presence of the refractive errors above indicated, revealed also in the R. eye some irregular astigmatism, the result of previous corneal ulceration, and thus satisfactorily accounted for its imperfect vision.

The patient was a fair-haired boy, but had sufficient hexagonal retinal epithelium to screen the choroidal structure all over each fundus.

By the direct method the fovea centralis of the R. eye shewed a small pin's head pit, from which there shone out a little silvery grey light, and uniform pigmentary stippling of the normal character surrounded it.

The fovea of the L. eye appeared at first sight to be appreciably larger than that of the R., and of a pale orange tint. On more deliberate inspection it became evident that this appearance was due to the presence of a bluntly crescentic pale orange spot embracing the inner and part of the lower border of the true fovea centralis, which was of the same size as the other eye, and could be quite clearly defined, but exhibited no silvery light reflex from its floor and sides. There was no appreciable hyperæmia nor hæmorrhage, nor exudation, nor increase of pigmentation at the affected part. The appearance suggested the idea that in the crescentic spot the hexagonal epithelial background had been gently wiped out so that a lighter choroidal glow came through to the observer. There was no evident loss of transparency of the anterior layers of the retina.

Treatment.—Dark glasses and abstinence from reading.

On the following day the pale spot beside the L. fovea appeared a little smaller, as if the pigment cells were creeping into it again at its edges. He himself thought the scotoma was slightly smaller.

June 19 (thirteenth day).—The grey spot still present, but noticed less and at 1 m. distance a 1 mm. white disc could be faintly perceived as "something" at the centre of the field.

Ophthalmoscopic Examination.—No pigmentless area now to the inner side of the L. fovea. On the contrary, the tint of the fundus immediately around this fovea is deeper, and the area of perifoveal stippling is a little larger altogether than in the R. eye. The pigment is very evenly distributed, there being no evident excess at the previously defective spot.

On July 10 (one month after the accident) there was very little, if any, difference between the two maculæ. The scotoma no longer obtruded itself. He could recall it faintly by blinking his eye.

At 1 m. a 2 cm. white disc appeared to him a little dull in the periphery of its left upper quadrant. Practically he considers himself well.

On December 23, 1892—about eighteen months after—I found that he was quite unaware of any unpleasant results of the exposure, and never noticed any spot before the eye, even when passing from a bright to a dull light, or *vice versâ*. He had been working steadily at school in the interval.

R. V. under correction, as before.

L. V. with — 0.5D. cyl. ax. /70° = $\frac{6}{5}$ almost perfectly.

No metamorphopsia could be elicited.

Ophthalmoscopic Examination.—The reflex from the R. fovea appeared a little the larger. The stippling around the L. fovea a little denser and redder than in the R., but the differences very trifling.

The L. optic disc appeared a little more hyperæmic than the R.

On turning to explore the fundus, my attention was quickly attracted to a patch indicating superficial choroidal disturbance, which must, I am sure, have appeared since I last saw him. It was in size about one-third of the optic papilla, and situated a disc and a-half's breadth from it, immediately behind the inferior temporal artery and vein. Its floor was of more orange tint than the surrounding fundus, and the hexagonal pigment seemed to have been lightly swept off into its upper and lower borders. There was no loss of transparency of the superjacent retina, nor other sign of active change. He was quite unaware of any disturbance having occurred in his sight, and could add nothing to the history of this patch.

Case II. (Seen on the fifth day after the eclipse of June 6, 1891.)—Of this case I have only a brief note:—A little hunch-backed boy presented himself at Mr. Berry's clinique on June 11, 1891, and I have to thank Mr. Berry for kindly allowing me to see the case and mention it here.

Since watching the eclipse of June 6, he had suffered from a *rotating bright spot* before his R. eye.

Ophthalmoscopic Examination.—By the direct method I found an appearance at the R. fovea, and in its immediate neighbourhood, precisely similar to that described in Case I. The central part of the R. macula appeared pale and flatter than the L. There was a minute orange-tinted spot at the outer side of the fovea, appearing as if a few grains of the ordinary pigment stippling had been removed. There was no appearance of exudation into the retina. I had no opportunity of examining the case further.

I suppose that in both of these patients the appearance was due to a minute chorio-retinitic exudation, extending sufficiently far into the outer layer of the retina to obscure the hexagonal epithelium. But the evidence of any inflammatory reaction was so undecided as to raise a suspicion that the pigment cells had been temporarily bleached (or paralysed in a state of contraction) at the affected part.

Case III. (Seen on the seventh day after the eclipse of June 17, 1890.)—Miss L., a young lady, had watched the progress of the eclipse with great interest, because she had recently been studying astrology. She informed me that the moon was her ruling planet, and that she ought to have been more on her guard, for it was predicted that something affecting her health would befall her on the day of the eclipse. The solar attraction proved the stronger. At first, gazing directly at the sun's disc with both eyes open, she felt too dazzled to see what was passing betwixt her and its surface, but by degrees her eyes became accustomed to the brilliant light, and she made frequent observations, conducting them latterly through a small brass tube about one inch and a-half in diameter, placed before her R. eye. It was not until the evening that she experienced a difficulty in reading, which continued for some days and, as it seemed to her at first, affected both eyes.

On *June* 24, just one week after the accident, Miss L. came to me, and by that time had satisfied herself that the R. eye only was at fault. She complained of a slightly painful feeling in the eyes, but chiefly of a positive scotoma, and described it as "a sort of wheel of revolving light, turning very rapidly, first one way and then the other, not quite constant; more noticeable when thinking about it, and observed more in the dark than in the daylight."

R. V. = $\frac{6}{9}$, with — 0.5D. cyl. ax. horizontal = $\frac{6}{6}$, but the test types were read with increasing difficulty from above downwards, because the letters looked at directly, were obscured by the central scotoma. When trying to fix the middle letters of a row of test type, the letters with which the line commenced and ended were much more clearly seen by her.

L. V. = $\frac{6}{9}$. With — 0.5D. cyl. ax. horizontal = $\frac{6}{6}$, without any obscuration.

The scotoma was found to subtend an area about 1 centimetre in diameter, at 1 metre from her eye. When looking at a white surface the spot appeared to be "*greenish*" in tint.

The fields of vision were otherwise normal.

Ophthalmoscopic Examination.—Media transparent; nothing abnormal could be detected in either fundus. Her extreme timidity and fear of the light prevented my employing the direct method of examination.

Treatment.—London smoke glasses (No. 2) for constant use; entire abstinence from reading and fine work.

On *July* 1 (fourteen days after the accident), the sensation of whirling movement appeared to have almost ceased. The spot seemed less green and more grey. At one metre's distance the scotoma now measured 8 mm. in diameter.

On *July* 14, Miss L. wrote, "the spot is not so bad as it was, but I cannot see distinctly with the R. eye. I am not using them at all, and am wearing the dark glasses."

On *Nov.* 12 (twenty-one weeks after the accident), Miss L. returned, stating that with both eyes open she no longer noticed the spot in walking about, or even in reading. But that on looking at a bright light, or coming from a bright diffuse light into a darker place, she still occasionally saw the whirling. The movement is very quick, and she could not be sure now whether the rotation was first in one direction and then reversed. In looking with the R. eye alone at distant type, she still perceived a little dimness over any letter fixed which was not dispelled by correcting her refractive error. With —0.5D. cyl. ax. hor. R. V. = $\frac{6}{6}$ with difficulty. At one metre's distance a 2 mm. white disc appeared fairly sharply defined.

Ophthalmoscopic Examination.—The appearance of the two maculæ was quite identical.

Miss L. considered herself practically quite well again.

On *November* 28, 1892 (nearly two and a-half years after the occurrence), in reply to an inquiry, Miss L. wrote, "I am thankful to say that I very seldom feel anything wrong with my eye at present; occasionally when *coming out of the dark* I see the spot, or rather, *quickly moving wheel*, but I scarcely notice it unless I am thinking of it."

With a view to determining whether any metamorphopsia was present, I sent her a piece of white paper with a series of parallel black lines, ruled at intervals of 2 mm., and numbered as in the accompanying figure (fig. 2), requesting her to apply the test while standing with her back near to a well-lighted window.

Her report of the result was:—

With the L. eye nothing peculiar observable. With the

R. eye when the lines are held vertical, line 6 just above the black dot appears obscured and the little wheel appears there. Nos. 5, 7, 8 and 9 bulge outwards just above the spot.

Held horizontally, line 5 above the dot *bulges upwards*, and 4, 3 and 2 slightly so. Carrying the eye upwards they all wave. The distortion is more marked when held horizontally.

The paper to be held at arm's length and in a vertical plane each time. Look at the central spot, and test each eye separately.

Second Experiment :—Hold thus—lines horizontal.

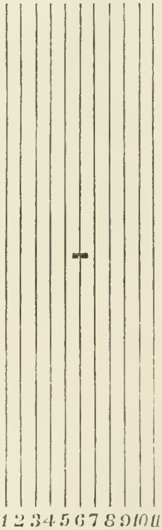


Fig 2.

First Experiment :—Hold thus—lines vertical.

Case IV. (Seen on the eighth day after the eclipse of June 17, 1890.)—J. E. M., a student of medicine, aged 20, was travelling from St. Andrew's to Edinburgh on the morning of June 17, 1890, and watched the progress of the eclipse with much interest during his two hours' journey. The Forth Bridge afforded a good place for observation as the clouds had rolled away, and on arrival at the Haymarket Station in Edinburgh (9.30 a.m.), he continued his observations, for the eclipse was then at its height. He always shut his left eye, and generally looked through the smallest chink between the fingers of his right hand.

He felt dazzled after each observation, but this sensation passed off in a few minutes. Arrived at his lodgings, he read for an hour without difficulty, and then went to the Royal Infirmary to pursue his clinical studies. About midday, while going round the wards he became conscious of the fact that he could not see the eye of his teacher, which he looked at directly.

In the afternoon, while at a class of microscopy, and later in writing an examination paper, he was greatly annoyed by a dim spot before his R. eye, and the difficulty increased towards evening.

Mr. M. came to me on June 25, and added to the above history that the spot had at first a "*greenish tinge*," appeared quite stationary, showing neither wheel movement nor oscillation, and was sharply cut. Since then he had noticed a *reddish* tinge in it sometimes, and at the time of his visit it was *yellowish green*.

R. V. = $\frac{6}{9}$ dimly and with the same kind of difficulty as described in Case I. With —0.75D. sph. = $\frac{6}{6}$ slowly, but he was conscious that he obtained this result by indirect fixation, always reading the letter to the right of that which he looked at.

L. V. = $\frac{6}{9}$ partly. With —0.75D. sph. = $\frac{6}{5}$.

With his R eye, at a distance of one metre, he could see (though not quite so clearly as with his L.) nearly the whole surface and circumference of a 4 mm. white disc exposed on a black surface, provided that he fixed his gaze on its centre, but observed that it was embraced upwards and inwards by a large dim greenish spot. Fig. 3 is taken from a sketch made by himself.

It represents a scotoma of about 10 mm. diameter with a notch, slightly overlapping the upper and inner sides of the 4 mm. white disc, to the centre of which his eye was directed. The defect was not uniform. The densest shading represents the part where the scotoma was absolute for white and colours; 2 mm. discs were quite invisible. A 3 mm. white disc, held at this part, introduced a whitish tinge into the green scotoma, and larger discs of white became faintly visible. Even 7 mm. discs of green and blue were unrecognised; one of yellow appeared much paler than normal, while one of red seemed a deeper "venous red." Mr. M.'s visual disturbance was thus of the nature of a projected photogram of the eclipse phenomenon, and he attributed the special shape and site of the scotoma to the fact that he always looked directly at the black eclipsed portion of the sun.

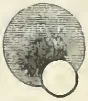


FIG 3.

Ophthalmoscopic Examination.—On most careful direct examination I could not satisfy myself of any decided difference in the two fundi. Each disc had an imperfect choroidal ring, a large physiological cup and well proportioned vessels. A silvery halo encircled each macula, each fovea centralis was indicated by a little bright dot, and there was a slight deepening of the tint of the fundus around. This pigmentary darkening was perhaps a little more marked in the R. eye, but the difference was extremely slight.

Treatment.—Dark glasses, abstinence from reading and microscopic work.

On the following day Mr. M. reported that the scotoma was flattening from above downwards, and that its lower "horns" were getting rounder.

By *July* 8 (twenty-one days after occurrence) the scotoma was smaller in all its dimensions, but a 2 mm. white disc was still lost to view in the densest part. He noticed the spot less now in reading, and found that it became less evident if he gazed steadily at an object, but was intensified by rapid blinking of the eye.

On *Oct.* 13 (nearly four months from occurrence) Mr. M. returned after the long vacation, having used his eyes little for reading, and stated that he still noticed a greenish spot on rising in the morning and for about an hour thereafter, that it was less evident through the day, was more obtrusive in the evening, and could be summoned at any time by blinking rapidly. R. V. = $\frac{6}{6}$ perfectly, with —0.75D. sph. No absolute scotoma for white could now be found at one metre's distance, even when tested with a 1 mm. disc, but the test object appeared least well defined when held about 3 mm. above the point of fixation. A better estimate of the defect was obtained from colour tests.

When fixing directly a 7 mm. disc of red, or yellow, or blue, at one metre's distance each appeared clear and distinct save for a little want of definition at its upper edge. On fixing its lower border the upper half of the surface appeared much paler than the lower, especially in red and yellow. And when a point, half the disc's breadth, below the lower edge was fixed the upper half stood out clear, while the lower entered the scotoma and appeared pale. There was thus an eccentric partial colour scotoma still present, having a vertical diameter of about 3.5 mm. In this area a 2 mm. red or yellow disc became in each case "whitish," but was not lost to view.

Ophthalmoscopic Examination.—The only difference I could perceive in the two maculæ was that the light reflection from the R. fovea was a little less and rather bluish or mauve tinted, while that from the L. was a minute "bull's eye" reflex of the usual silvery grey character.

Mr. M. now resumed his usual studies, and from this time practically considered himself well, the spot no longer troubling him in reading with both eyes open. On various occasions in 1891 and 1892 he stated that he had entirely recovered.

In *Dec.*, 1892, I sent him the test for metamorphopsia (see fig 2, p. 48) which he returned with the following remarks :—" With the L. eye there is no abnormality. With the R. eye line 6 appears a little wavy above the central dot when the lines are held vertically. When they are held horizontally line 5 is distinctly *bulged in* towards the central spot, and line 4 also, but to a less extent."

Case V. (Seen on the sixteenth day after the eclipse of June 6, 1891.)—Mr. A. C. H. (24), student of law, was sent to me by Dr. E. Carmichael on June 22. He had watched the eclipse of Saturday, June 6, through the almost closed fingers of each hand and with each eye. On the same evening, but not until two or three hours after the observation, he noticed a sun image before each eye. He did not pay much further attention to it until Monday forenoon, when after a good deal of office work, he began to notice a blurred spot before his eyes. For some days he did not observe whether it was confined to one eye or not, but eventually located it in his L. The spot took the form of *a greyish star turning sometimes one way and sometimes the other at very short intervals.* He did not complain of any distortion of objects looked at. I did not specially test him for metamorphopsia at that time.

R. V. = $\frac{6}{5}$.

L. V. = $\frac{6}{9}$ partly, and a letter or two of $\frac{6}{6}$, remarking that he saw least well the letter directly fixed, and the one to the right of it better than the one to the left.

At one metre's distance, when fixing the centre of a 4 mm. white disc, the left side appeared obscure. When fixing its right edge the left border just came into view, so that the scotoma for white measured nearly 4 mm. in its horizontal diameter, and lay to the left of the middle line.

Ophthalmoscopic Examination.—There was no marked difference between the two maculæ. If any, it appeared as if the pigmentation around the L. fovea, and especially to its inner side, was rather deeper toned than in the R. eye.

On *August* 20 he returned, stating that the spot was no longer noticeable when using both eyes, but became evident on closing the R. The dimensions of the scotoma seemed little altered. L. V. = $\frac{6}{6}$ with eccentric fixation. In reading J. 1, the word directly fixed was obscure, those on either side were distinct.

Ophthalmoscopic Examination.—The R. fovea was poorly distinguishable from the surrounding fundus. The L. was more defined as a pale yellowish depression the size of a small pin's head with a narrow ring of pigment around.

On *December* 15, 1892, Mr. H. kindly came at my request. He reported that the spot was still visible at times. I proceeded to test him for metamorphopsia as in the previous cases. When trying to fix the central black dot (fig. 2) with his L. eye, the whirling movement formerly complained of in the scotoma again made fixation difficult for a moment, but was not constant and would not appear when wanted, so that he could not analyse the sensation further. He gave it as his experience that it generally intruded when he was trying to fix some fine object a little beyond his ordinary reading distance.

He was conscious of no distortion in the lines if held within half a metre of his face, but beyond that distance metamorphopsia appeared and was most marked at 0.75 metre. At a greater distance all the lines became less distinct. The distortion consisted in *a bulging outwards* of lines 4, 5 and 7, and was present to about an equal degree whether the lines were held horizontally or vertically.

Case VI. (Seen on the seventeenth day after the eclipse of June 6, 1891.)—Mr. A. F. M. P. (28), student of medicine, with the flame of an ordinary match, blackened a piece of plain glass just sufficiently to soften the glare, and therewith proceeded to observe the eclipse—at first for ten consecutive minutes and thereafter at frequent intervals during the next hour and a-half. He occasionally, but seldom, looked with his L. eye. After his observations were concluded he noticed a difficulty in seeing. It seemed to affect both eyes, but he did not test them separately at this stage. The faces of his friends looked yellowish, so much so that he asked one if he had jaundice. Later on in the evening he noticed that with the R. eye alone, he failed to see properly the right side of any face he looked at—it appeared grey, black, or blotted out. On closing this eye he saw a persistent after image of the partially eclipsed sun, and believes it was still present to some extent, two days later. He had no sensation of whirling movement, oscillation, or colour changes. After four or five days he paid no particular attention to the spot, as it did not trouble him much, but noticed at times in reading that some letters were blotted out of words.

My first opportunity of examining him was on June 23. At ordinary reading distance he saw no grey spot when looking at a sheet of white paper.

R. V. = $\frac{6}{6}$. With + 2.5D. sph. better, but when fixing the middle letters of the row, he observed that two letters to his left were obscurer than those to his right.

L. V. = $\frac{6}{5}$ partly. With + 3D. sph. = $\frac{6}{5}$ perfectly.

He was not aware of his hypermetropia, and had never worn glasses. On testing his R. eye with white discs of increasing size at one metre's distance, he admitted that there was an appearance of a shade over the left side of each disc, increasing to a maximum at the left lower edge, and every circular disc from 3 mm. to 2 cm. in diameter appeared elliptical, but he could not at this time delimit the scotoma accurately, probably because it extended for more than 1 cm. to the left of the point of fixation, and I should have gone on using larger white discs until he was able to see the left lower edge of one clearly, or made him *fix* the right side of the disc, as I did at his next visit.

He had noticed some metamorphopsia, for in walking along a street the area railings at a certain distance appeared to have an upward bend. When a flat lath of wood was held so as to project horizontally forward from the right side of his head at the level of his eye, he located the bend at a part about 85 cm. from his eye.

Ophthalmoscopic Examination. — Very little difference visible between the two maculæ. Each showed a fairly distinct fovea, that of the R. eye appeared slightly the larger, and with very uniform pigmentary toning of the surrounding macula. In the L. eye the pigmentary distribution was rather less uniform, and this difference was better marked in the eccentric parts of the macula than immediately around the fovea.

On *December* 3, 1892, Mr. P. came at my request, and stated that he was ordinarily unconscious of any permanent defect following the accident. Occasionally, after reading for a long time, a letter or two to the left of the one fixed, seemed blotted out.

When tested for metamorphopsia with the lines vertical, he observed no distortion. When held horizontally he was conscious of none at or within 45 cm., but beyond that distance and to the furthest limit at which the lines could be recognised as distinct from one another, he observed with his R. eye that the lines below the fixation dot *bulged downwards*. He also mentioned that he still noticed occasionally the bend on street railings previously described.

Tested with white discs at one metre's distance, and with + 2.5D. sph. before his R. eye, the whole circumference of a 2 mm. disc appeared quite sharp, but of discs from 3 mm. upwards the edge of the lower quadrant to his left seemed flattened and ill defined.

When looking at a 2 cm. white disc, he required to fix the edge of the upper quadrant to his right before the diametrically opposite border (down and to his left) came sharply into view, so that the area of his retinal defect subtended nearly 2 cm. at 1 metre (= a retinal area of 3 mm.), and lay downwards and inwards from the fixation point.

R. V. = $\frac{6}{9}$. With + 2.5D. sph. = $\frac{6}{6}$ with one letter wrong, and some of $\frac{6}{5}$.

L. V. = $\frac{6}{6}$. With + 3D. sph. = some of $\frac{6}{5}$.

Ophthalmoscopic examination revealed nothing new.

Case VII. (Seen on the seventeenth day after the eclipse of June 6, 1891.)—Mr. J. W. (30), student of medicine, watched the eclipse for about an hour at short intervals. He looked almost entirely with his R. eye, and except for one or two brief exposures always looked through a glass. He first used a deep blue glass, but found that it afforded little protection, for the sunlight made him blink excessively, and left a brief after-image. He then employed "medium London smoke" glasses folded double in front of the blue glass, and with this arrangement perceived no after-image at that time. When the eclipse ended, about 5.30 p.m., he had a sensation as if he had used his eye too much, and was glad to cease looking. When taking his last glance at the sun he noticed that he did not see so clearly as at first. About two hours later, on looking out of the window, he saw a dark spot before his R. eye, which moved with the eye. It had no oscillation nor rotation nor colour. On the following day, besides a difficulty in reading, he found on closing his eyes that he had images of one, two, or sometimes three suns before his R. eye. The explanation of this was that in using the combined glasses on the previous day he had not always held them accurately superposed, and remembered that he saw more than one image of the sun. Mr. W. continued to see these sun-images on closing his eyes for more than forty-eight hours after the observation.

On *June* 23, when I first saw him, he only complained of a want of definition of any small object looked at with his R. eye.

R. V. = $\frac{6}{6}$, but not by direct fixation, for any letter of this row looked at directly was not seen.

L. V. = $\frac{6}{5}$.

His scotoma was very small and central. At one metre's distance a 3 mm. white disc seemed to subtend it fairly exactly, leaving only a little spindle-shaped part visible in the upper quadrant to his right side, reminding him at once of the appearance of the eclipse, for the moon had covered this part of the sun's surface (fig. 4).

FIG. 4.

Ophthalmoscopic Examination.—If anything, the L. fovea appeared the larger and paler, while the R. circumfoveal area seemed a little the darker, especially at its outer side. Seventeen days having elapsed since the exposure, the primary effect may have passed away, and the secondary darkening come on.

Fifteen months later (September 24, 1892) Mr. W. kindly came again for examination.

R. V. = $\frac{6}{5}$, but does not see properly the letter directly fixed.

The scotoma is not obtrusive at close quarters. It is not seen against a sheet of white paper at the ordinary reading distance.

At one metre's distance the scotoma for white appeared to measure rather less than 2 mm. in diameter. He had also some metamorphopsia affecting a larger area, for on testing him with black lines 2 mm. apart at one metre's distance he remarked that two lines on each side of the central dot *bulged outwards* when held vertically, and three lines on each side when held horizontally.

Ophthalmoscopic Examination.—The R. fovea was seen with difficulty, and, indeed, only after moderate artificial mydriasis, because it was so slightly differentiated from the surrounding macula. At the usual site of the fovea were four or five minute yellowish areas with intervening pigment toning. The L. fovea was easily visible as a well-marked buffy yellow pit. In other respects the fundi appeared identical.

Mr. W. stated that for some months after the accident he found considerable difficulty in judging of distance, *e.g.*, in playing golf, but was now better in that respect.

He was by nature right-eyed and remained so still, but finds in shooting at a small mark with a rook-rifle that he has to use his left eye and fire from his left shoulder to ensure accuracy of aim.

With his R. eye he has to ascertain the position of the mark by an eccentric direction of the eye, but losing sight of it as soon as he tries to take aim along the barrel, has eventually to guess the position of the object.

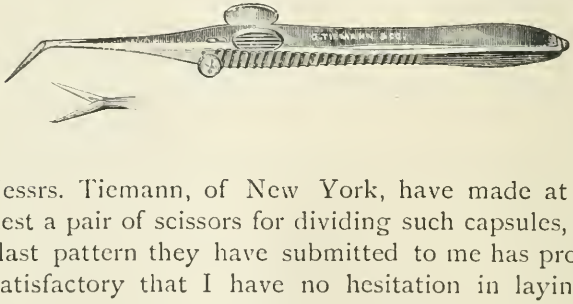
In using the microscope also, he now finds his L. eye the more useful.

(To be concluded in next number.)

A NEW FORM OF CAPSULE SCISSORS.

By H. Lindo Ferguson, M.D., F.R.C.S.I., Dunedin, New Zealand.

All surgeons in ophthalmic practice have, from time to time, trouble with cases of thick opaque capsules, which do not yield to Bowman's needle, or even to discission with two needles. In those instances where there has been iritis present and posterior synechiæ exist, the risk of any operation involving dragging on adhesions is considerable, and any means of dividing the capsule without dragging, either on adhesions to the iris or on the attachment to the ciliary processes must lessen the danger and improve the results of the operation, a consummation devoutly to be desired.



Messrs. Tiemann, of New York, have made at my request a pair of scissors for dividing such capsules, and the last pattern they have submitted to me has proved so satisfactory that I have no hesitation in laying it before my professional brethren in the hope that it may be as useful to them as I have already found it.

The general shape of the scissors is the same as that of the well-known Wecker's scissors, but the blades are turned in the opposite direction to the usual pattern, and lie closed instead of open when the scissors are in a position of rest. The blades are sharp on the outer as well as the inner edges, so that the scissors cut out when the blades are opened. and in when the spring is allowed to close them. The blades are very fine, and will pierce a capsule as readily as a Graefe's knife. They are separated by the same action that closes the Wecker's scissors to an amount that can be regulated by a screw before operating. A small incision is made in the cornea with a lance-shaped knife through which the scissors are introduced, and the capsule is pierced at the centre of the desired opening; the blades are then separated, and cut the capsule to the required extent without any drag, either on the ciliary processes or any adhesions that may be present, while if it is wished to excise a portion of the capsule one blade can be slipped in front of it, and in closing to their position of rest the blades will cut like an ordinary Wecker's scissors. The ease with which the instrument can be taken to pieces and thoroughly cleaned gives it a great advantage over the old form of cannula scissors, while the difference in design gives much greater power in dealing with tough or cretaceous capsules.

PAUL BRAUNSCHWEIG (Halle). Primary Tumours of the Optic Nerve. *von Graefe's Arch., xxxix., iv., p.* 1.

This paper contains an account of four cases of primary tumour of the optic nerve observed by the author: In two of these a new method of operation was carried out. It also contains a synopsis of ninety-four published cases (including his own four), and though in many instances the accounts are far from complete, the author has been able to arrive at some interesting conclusions as to the course and treatment of such tumours.

Predisposition. The disease is rare, in Germany only thirty cases have been reported. Of sixty-eight cases where the side is mentioned the left nerve was attacked in forty-four. The patients were mostly youthful. Of seventy-seven cases twenty-nine were under 10 years, twenty-nine between 10 and 20 years, nine between 20 and 30 years, four between 30 and 40 years, and six over 40 years of age; as these tumours are generally myxosarcomata this predisposition of early life is what one would expect from analogy with such tumours in other parts.

Aetiology. Heredity has no influence in causing these tumours, injuries or previous febrile affections have been reported in some cases and may favour their growth; it is noticeable that they often commence about the place of entrance of the vasa centralia (15 or 20 mm. behind the globe), that their structure is generally embryonic in character and that they are sometimes congenital. They may, perhaps, therefore develop in connection with the embryonic cells brought in by the vasa centralia.

Symptoms. The most marked and constant is exophthalmos, steadily increasing forwards and slightly downwards and outwards. The globe cannot be pushed back, though pressure causes no pain; ocular movements are generally comparatively good, for (unlike malignant growths) the tumour does not involve the muscles, and the ocular end of the nerve is usually not attacked. Strabismus and diplopia are common, and were in four cases the first symptoms. Great impairment or complete loss of vision is usual (87 per cent.) In the fundus all stages of neuritis, from the first swelling of the papilla (owing to pressure on the efferent vessels) to the final post-neuritic atrophy; in four cases simple atrophy without previous neuritis was noted, and in four others degenerative changes in the macular region; owing to the sheltered position of the ganglion ciliare the consensual action of the pupil is generally retained. Pain is generally absent, and headache, as a sign of cerebral involvement, seems of no value; cerebral symptoms have been observed even with a tumour still intraorbital. Pressure may cause neuralgia of the intra or supraorbital nerves and by shortening the axis of the globe often causes hypermetropia.

Diagnosis. The points which distinguish them from other orbital growths are: 1, slow, painless growth, without signs of inflammation; 2, early loss or sudden impairment of vision; 3, relatively unimpaired mobility of the globe; 4, their position; (they can be felt to join the globe and the foramen opt.). Palpation should, if necessary, be done under anæsthesia.

Treatment. This must be operative: eleven deaths are reported, mostly before antiseptics were in use or from cerebral complications. The eye was formerly sacrificed, but lately attempts to preserve it have succeeded (six cases, in two of which, however, the tumour had a pedicle have been recorded). The method of operating usual is to remove the tumour through the conjunctiva, cutting through as many of the muscles as may be found necessary. Following Krönlein (Beiträge zur Klin. Chir. iv., 1, Tübingen, 1887) the author operates as follows: The line of the incision starting about 1 cm. above the outer upper angle of the orbit runs along the outer orbital margin till it reaches the zygomatic arch, where it bends backwards to end at about the middle of the arch; along the orbital margin the incision is deepened so as to go through the periosteum, which is then, by means of an elevator, raised from the whole outer wall of the orbit. The elevator is then pushed through the inferior orbital fissure, and with a chisel a wedge-shaped piece of bone is cut out of the outer orbital wall. The base of this wedge is the outer margin of the orbit, and its apex the lower end of the inferior orbital fissure, to which the elevator serves as a guide. When this has been done the piece of bone, though still attached to the skin and muscles of the temple, can be so far turned out that the orbital cavity is exposed.

The author found this proceeding quite easy to carry out, and by its means complete access to the orbital cavity is obtained; the optic nerve may be examined as far back as the optic foramen, and any orbital growth removed with the least possible damage to the surrounding tissues; the external rectus can be drawn aside with blunt hooks, or divided and afterwards sutured; when fixed in its place again the bone heals readily and without deformity.

This operation has been performed four times by the author—in two cases for tumour of the nerve; these are given below. In two other cases, where deep-seated malignant growths in the orbit were suspected (though the possibility of tumour of the nerve was recognised), he also operated in this way; one of these is reported at length, and though exenteration of the orbit was finally found necessary, healing was in no way interfered with by the bone resection; on the eighth day the bone was firm in its place. Recurrence of the tumour after operation is infrequent: excluding those cases in which the diagnosis was uncertain, it has been reported seven times; in one of these cases the tumour was an endothelioma; excluding this, six recurrences (in about sixty cases) are left for true myxosarcomata, and it must be remembered that in many cases the removal was incomplete.

Pathological anatomy.—All tumours of the optic nerve belong to the connective tissue class; they are generally benign, and are nearly always encapsuled by the dural sheath; the lymph glands are not involved, and metastatic growths do not occur. In six cases the growth probably extended into the cranium, in five others it certainly did so; of these eleven cases seven died; the fate of four is unknown.

The tumours are either endotheliomata or myxosarcomata. The former are supposed to originate from the endothelium of the lymph vessels, or from the endothelium (or perithelium) of the blood-vessels; they are characterised by their alveolar structure. The walls of the alveoli have an endothelial lining; within them lie masses of cells which may undergo hyaline degeneration (these used to be confounded with the cell-nests of epithelial tumours), or by the deposit of lime-salts in them give rise to the type of tumour described as Psammom-sarkom (sarcome angiolithique). The endotheliomata reported are about twelve in number.

All the other tumours may be classed as myxosarcomata, as myxomatous tissue, to a greater or less extent, is probably always present; there may be so much of it as to make the tumour quite soft. As mucin has been shown by Koester to be a regular constituent of adult as of fœtal connective tissue, the myxomata can no longer be said to form a separate class; the mucus in these tumours is formed by the swelling of this tissue from absorption of serum (possibly also by cell degeneration).

Case I.—Healthy boy, aged 7, with slight mental deficiency and clumsiness of speech; left eye getting prominent for six months. When seen, right eye normal; left exophthalmos (the cornea about 10 mm. in advance of the right cornea), globe displaced downwards, forwards and slightly inwards; lid space enlarged by displacement of lower lid; ocular movements restricted. V. = 0, cornea sensitive and clear; tension normal; white post-neuritic atrophy of disc, and spots in macular region; no pulsation of globe. After five weeks an operation was performed.

The recti muscles, with the exception of the rect. internus, were divided and the tumour removed. The globe was replaced with some difficulty owing to the copious hæmorrhage and the conjunctiva sutured; the lids were also closed by suture. On the fifth day, the globe appeared to have healed into its place and the stitches were removed, but in about ten days' time an ulcer of the cornea appeared, which finally led to the loss of the globe, which was enucleated forty-one days after the operation. The patient is still (six years after the operation) in good health. The tumour was 23 mm. in length, and about 17 mm. in width in its thickest portion; on section it was almost as hard as cartilage and reddish-grey in colour; the outer sheath of the nerve was movable and not thickened, the inner sheath, 3 mm. or 4 mm. in thickness, could be distinguished even with the naked eye. On microscopic examination, the tumour was found to be a myxosarcoma containing a few scattered remains of nerve fibre.

Case II.—Healthy girl, aged 15, loss of sight and prominence of right eye for two years. Right eye pushed out (about 14 mm.) by a tumour which could be felt in the upper and inner part of the orbit; ocular movements restricted ; no loss of sensation in the cornea, conjunctiva or neighbouring skin ; papilla grey, blurred and prominent, and the retina grey and discoloured round it to a distance of about 1½ P. D. V. = hand movements at 5 metres, field of vision much narrowed. Was kept two months under observation, and as the symptoms became more marked an operation was performed as in the last case, save that the rect. ext. was in this instance left intact, and not the rect. int. Except for some slight ulceration of the cornea, which passed away under treatment, healing was undisturbed. The girl was seen again more than two years after the operation ; the disc was then merely a white speck in the midst of a mass of old hæmorrhages ; except at its margin the cornea was anæsthetic, the pupil semi-dilated, transversely oval and immovable, the eye no longer prominent, but abducted ; tension normal.

The tumour removed was about 36 mm. in length ; the outer end was only about half as thick as the inner, which was 9 mm. in diameter ; the greatest diameter was about 17 mm. ; 6 or 7 mm. of the nerve next the globe appeared to the naked eye normal, but on microscopic examination there was found, even in this portion, proliferation of nuclei in the septa ; these septa gradually increased in thickness, and in the thickest part of the tumour no nerve-fibres were discoverable ; towards the foramen opt. the nerve bundles again became visible. The inter-vaginal space in the more central part of the tumour was enlarged, and in this part of the tumour the section showed spaces filled with a clear, mucus-like substance separated by firm bands of tissue. The tumour was mainly composed of long fibre cells, (Faserzellen), crossing each other in every direction with round cells and not very numerous myxoma cells lying between and among them. It was also, therefore, a myxo-sarcoma, but with more myxomatous tissue than the tumour in Case I. Many blood vessels, some with much thickened walls, were scattered through it.

Case III.—Healthy boy of 18 months ; left eye first noticed to be squinting and prominent about a year before. A month previously gastric symptoms and convulsions recurring at intervals were noticed, and the child lost spirits and forgot the few words he had learnt.

There was slight hydrocephalus; the left eye was prominent (about 10-12 mm.), and displaced down and inwards; lid space enlarged (lids did not cover the eye during sleep). Optic disc atrophic, arteries small, veins tortuous, retina round, disc infiltrated and cloudy. V. apparently $= 0$; pupil semi-dilated and fixed, cornea sensitive. Under an anæsthetic a cord-like tumour as thick as a little finger could be felt reaching backwards along the internal wall of the orbit; the left cheek was swollen towards the temple. Convulsions, with loss of consciousness, were twice observed, and though it was feared the growth had entered the cranium an operation was undertaken. This was carried out with re-section of the external orbital wall as described above. The tumour burst when grasped with the forceps. Healing, except for an attack of convulsions on the fourth day, was normal, and the position of the globe excellent. The child was sent home on the ninth day; he remained well for fourteen days, but then had frequent convulsions and died on the twenty-eighth day after the operation. No *post-mortem* was possible. The tumour was so torn by the forceps that a complete examination could not be made. Nerve fibres were only discovered at the bulbar end; it was also a myxo-sarcoma.

Case IV.—Young man, 24 years of age. Prominence of the left eye, with gradual failure of vision, had been noticed for a year and a-half. Left eye protruded (about 2 cm.), and displaced downwards and outwards. Motions slightly restricted (motion inwards markedly so), pupil wider than right, and does not act so well; refracting media clear; papillitis with gray red discolouration of surrounding retina; height of papilla about 2 mm. V. $= \frac{5}{36}$; field contracted about 10 to 15° all round. Under an anæsthetic a firm tumour in the position of the optic nerve was felt in the upper and inner part of the orbit. The operation was performed as in the last case, except that the lids were sutured on account of hæmorrhage from the deeper parts, and thirteen days after it the patient was sent home with the eye in excellent position, and the resected bone firm in its place. The cornea, except in the lower inner quadrant, was anæsthetic, pupil wide and fixed, the fundus with appearances as after commotio retinæ, and the vessels of the papilla very thin. When seen again some weeks later the position of the globe was still excellent, the contour of the papilla was lost, and there was copious pigment formation all over the fundus. There was no deformity of orbit. The tumour was 28 mm. in length, and 18 mm. in its greatest diameter. The nerve was displaced upwards, the pial sheath was involved in the growth, the dural sheath apparently normal. On microscopic examination the number of vessels was noticeable. The growth was mainly composed of cells with clearly defined round nuclei, and with long narrow interlacing processes, also of a smaller number of small round cells with round or oval nuclei. Scattered through the tumour in every part were cysts containing a mucus-like substance. Like the other tumours, therefore, this was a myxo-sarcoma.

W. G. T. STORY.

Statistics of the Blind in England and Wales.

Extracted from the Census of England and Wales for 1891, *published* 1893, *vol. iv., pp.* 70-72*; vol. iii., Summary Table* 19. (*Compare Extract from previous Census*, OPHTHALMIC REVIEW, *vol. iii., p.* 52, 1884.)

Under the heading "Physical Infirmities," the compilers of the report point out that the returns of persons suffering from blindness, deafness, and mental derangement, are, in all probability, excessively inaccurate, partly through the unwillingness of persons to admit, either as regards themselves or their children, the existence of any serious infirmity, bodily or mental; partly through the difficulty of deciding, in the absence of a fixed standard, what degree of impairment of sight, hearing, or mental capacity, constitutes blindness, deafness, or insanity. No person is absolutely blind who can perceive, however faintly, a ray of light, however brilliant; but for practical purposes, anyone may be considered blind who is unable to direct his path by means of sight; and it is probable that much slighter defects in vision than this will have been held sufficient by many sufferers to justify themselves in stating that they were blind. The inaccuracy due to unwillingness to declare the defect scarcely applies, probably, to the blind, or at any rate, applies to them in a much less degree than to the deaf or the insane.

The total number of persons returned as afflicted by blindness was 23,467, being in the proportion of 809 to 1,000,000 of the population, or one blind person in every 1,236. The proportion of the blind to the population has fallen at each successive enumeration since 1851, in which year account of those suffering from this infirmity was taken for the first time; but the decrease has been much greater in the last two decennia than in the preceding intercensal periods, as may be seen in the following table:—

Year.	Number of Blind.	Blind, per Million, enumerated.	Persons enumerated to one Blind Person.
1851	18,306	1,021	979
1861	19,352	964	1,037
1871	21,590	951	1,052
1881	22,832	879	1,138
1891	23,467	809	1,236

This continuous decrease can scarcely be attributable to other causes than the greater precautions taken to prevent the ravages of purulent ophthalmia, the improvement in the surgical treatment of affections of the eyes, and the diminished prevalence of such diseases as small-pox, to which a not inconsiderable amount of blindness was formerly due. But that even now, in spite of these improvements, a considerable proportion of blindness is due either to purulent ophthalmia or other diseases that specially affect children may be inferred from the facts that, of the 23,467 blind persons of all ages, 4,005 were stated to have been blind from childhood, and that among these 4,000 were 1,188 children still under ten years of age.

Of the blind, 12,281 were of the male and 11,186 of the female sex, being in the proportion of 874 males and 748 females per million living of each sex. Thus 1 in every 1,144 males was blind, but only 1 in every 1,336 females. This greater liability of males than of females to blindness, which has been noted in every previous census, and is, moreover, not peculiar to England, but a phenomenon presented by most, though not all, other countries, is doubtless in part attributable to the differences between the two sexes in regard to their occupations and their exposure to accidents : but some of it must apparently also be due to the greater liability of male children to almost all kinds of diseases ; for, if the comparison be limited to those whose blindness dates from childhood, and therefore came on before differences of occupation or of liability to accidents can have come into operation, the sexual disproportion is quite as great as among those whose blindness came on at a later date. Among males 156 per million were returned as blind from childhood, which may be taken as from some time or other in the first ten years of life, while among females the proportion was only 121 per million.

That to be blind from childhood is a most serious impediment, barring the entrance into almost all occupations, is, of course, obvious; but to what extent, if any, does it operate in shortening the term of life ? If it does so in any notable degree, it is plain that the proportion of those who suffer from it, to the total population of the same age, should become smaller and smaller with the successive age-periods, and such does in fact appear to be in some degree the case ; for if we begin at the age of 15-20, we find that 151 per million living at that age have been blind from youth, while in the next period, 20-25 years, the proportion falls to 140, then at 25-35 to 126, and then becomes successively, decennium after decennium, 118, 113, 124, 106, 106, and finally in the 85 and upwards period, where, however, the figures are much too small for safe estimation of rates, rises to 114. Disregarding trifling irregularities, it is plain that the proportion declines continuously, from which it must be inferred, supposing the returns to be trustworthy, that those who are blind from youth are, on the average, less healthy than those who are not so afflicted.

While the proportion of the "blind from childhood" to the total number of persons living thus continuously decreases in the successive age-periods, the proportion of those who have become blind at any age as continuously increases, as the following table shows, which gives for the three last censuses and for each sex the proportion of blind at successive age-periods per million living of corresponding age and sex.

BLIND PER MILLION OF CORRESPONDING AGES.

Age-period.	1891.			1881.			1871.		
	Persons.	Males.	Females.	Persons.	Males.	Females.	Persons.	Males.	Females.
All ages - -	809	874	748	879	953	809	951	1,029	876
0— - -	155	168	142	166	172	161	185	189	180
5— - -	238	255	220	288	312	263	306	345	267
15— - -	370	419	322	388	449	328	404	451	358
20— - -	385	457	321	422	491	359	451	518	390
25— - -	585	721	460	641	800	494	680	871	506
45— - -	1,555	1,864	1,278	1,625	1,947	1,336	1,720	2,002	1,459
65— - -	4,133	4,343	3,962	6 915	6,897	6,929	5,000	5,123	4,893
75— - -	9,849	9,693	9,967				11,655	11,785	11,551
85 & upwards	19,073	17,940	19,742				24,133	21,450	25,810

The occupations open to those who have been blind from childhood, though more numerous than might be supposed, are not very numerous; and the great majority of those afflicted, and especially of those who are of the female sex, are returned as unemployed. The occupations of the remainder are given in detail in the following table :—

OCCUPATIONS OF MALES AND FEMALES RETURNED AS BLIND FROM CHILDHOOD IN ENGLAND AND WALES.

TOTAL:—MALES, 2194; FEMALES, 1811.

	M.	F.
I. PROFESSIONAL CLASS.		
Postman	1	—
Clergymen (Established Church)	4	—
Calvinistic Minister	1	—
Missionary, Scripture Reader, Itinerant Preacher	9	1
Bell Ringer, Organ Blower	3	—
Herbalist	1	—
Medical Rubber	—	2
Schoolmaster, Teacher	11	12
Law Student	1	—
Authoress	—	1
Musician, Music Teacher	184	26
Theological Student	1	—
Modeller	—	1
Spirit Medium	1	—
II. DOMESTIC CLASS.		
Domestic Servant	1	11
Charwoman	—	1
Proprietor of Bathing Machine	1	—
Laundryman, Laundress	2	4
Workmens' Early Caller	3	—
III. COMMERCIAL CLASS.		
Railway Messenger	1	—
Hotel Yardsman	1	—
Carrier	1	—
Messenger, Porter	4	—
IV. AGRICULTURAL CLASS.		
Farmer	7	—
Agricultural Labourer, Farm Servant	6	1
Poultry Dealer	1	—
V. INDUSTRIAL CLASS.		
Librarian	1	—
Blind Scribe, Writer of embossed books	2	1
Printer's Assistant	1	—
Newsagent	13	—
Clockmaker	1	—
Pianoforte Tuner	43	—
Musical Instrument Dealer	2	—
Carpenter	3	—
Mason	1	—
Upholsterer, Mattress Maker	4	2
Plater's Helper in Shipyard	1	—
Inn, Hotel Keeper, Publican	4	—
Lodging, Boarding House Keeper	3	—
Yeast Importer	1	—
Milkseller	2	—
Butter Merchant's Assistant	1	—
V. INDUSTRIAL CLASS—(*cont.*)		
Butcher	1	—
Miller	1	—
Confectioner	2	—
Greengrocer, Fruiterer	2	—
Grocer, Tea Dealer	11	1
Silk Weaver (blind from 5)	—	1
Cotton Operative	1	4
Linen Weaver	—	2
Waste Dealer	1	—
Jute Machinist	—	1
Mat Maker	41	—
Dyer	1	—
Hearthrug and Net Maker	—	1
Knitter—Woollen, Fancy	—	65
Plaiter	1	—
Tailor's Apprentice	1	—
Bonnet Maker	—	1
Needlewoman	—	3
Shoemaker	5	1
Brushmaker	45	20
Japanner	1	—
Basket Maker, Chair Caner	203	58
Hay Dealer	1	—
Firewood Chopper, Piler	3	1
Employed in Paper Mill	—	1
Stationer	4	—
Coal Miner	4	—
Coal Merchant	1	—
Brickmaker	1	—
Water Ram Labourer	1	—
Water Pumper	1	—
Jeweller	1	—
Chainmaker's Assistant	1	—
Steam Hammer Driver, Iron Turner	3	—
Ironmonger's Assistant	—	1
Boltmaker's Labourer	1	—
General Shopkeeper, Dealer	4	—
Street Seller	21	7
Foreman, Forewoman	1	1
General Labourer	7	—
Fitter	1	—
Machine Worker	1	—
VI. UNOCCUPIED CLASS.		
Retired from Business	13	7
Pensioner	1	6
Living on own Means	34	66
Others (over 10 years)	801	955
Under 10 years of age	643	545

P. S.

A. ELSCHNIG (Graz). The Influence of Occluson of the Ophthalmic and Carotid Arteries on the Eye. *von Graefe's Archiv.*, *xxxix.*, *part iv.*, *p.* 151.

The occurrence of thrombosis of the internal carotid in its internal course up to the origin of the ophthalmic artery in a patient suffering from embolism of the central artery of the retina, gave occasion to the author to examine the question how the circulation in the eye is affected by such an obstruction. He first gives the description of two clinical cases, with the *post-mortem* examination.

Case I.—The patient, a woman of 51 years of age, had suddenly been taken ill; when admitted to the hospital she suffered from aphasia, somnolence, slight facial paresis, right hemiplegia without disturbance of sensibility, and enlarged heart. On the ninth day both eyes, externally quite normal, showed ophthalmoscopically pale but otherwise normal discs with vessels of fairly usual width. Death occurred six weeks after the attack.

The *post-mortem* examination revealed chronic endo-aortitis, thrombosis and obliteration of the left common and internal carotid beyond the origin of the ophthalmic artery, incomplete obstruction of the latter, encephalomalacia, hypertrophy and dilatation of the left ventricle. The obstruction of the ophthalmic artery was in the middle of the optic canal, and was caused by a polypoid adherent plug of connective tissue, probably embolic in origin. All the branches of the ophthalmic artery were of normal width, but in both eyes partly sclerosed; also both optic nerves showed chronic perineuritis, mainly in the optic canals.

Case II.—A woman, 76 years of age, fell down suddenly in the street, but soon recovered consciousness. There was paralysis of the right side of the mouth and of the right upper extremity, right leg paretic, sensibility normal, heart's action strong but arythmic; death after six days. The *post-mortem* examination revealed complete thrombosis of the left internal carotid and the commencement of the left ophthalmic artery, organisation of the thrombus with partial re-establishment of the circulation by canalisation, thrombosis of left middle cerebra lartery, white softening; arteries of the eye completely normal.

Of the cases published hitherto, only those of slow and gradual thrombosis of the ophthalmic artery have been adequately observed, while our knowledge of sudden occlusion by embolism is not sufficiently complete. In a case described by Virchow, in 1856, the internal carotid was completely closed, while the ophthalmic artery was open, and, like optic nerve and eyeball, quite normal. In a case reported by Uhthoff,[1] the ophthalmic artery was totally obliterated in the optic canal by an organised thrombus, but perfectly open and normal in its further course; blindness in this case was due to gummy degeneration of the intra-cranial part of the optic nerve and the chiasma.

The author comes, therefore, to the same conclusions as Uhthoff, that thrombosis in the ophthalmic artery has no direct immediate influence on the circulation in the eye. In the case of insufficient communication through collateral arteries, any such influence would first be shown by a sudden reduction in the fulness, the pressure, and the velocity of the blood-stream through all the branches of the ophthalmic artery, and secondarily, by a decrease of size and by endo-arteritic processes in them. In no case could the clinical picture of embolism of the *central artery of the retina* be produced, inasmuch as the ciliary arteries would also be affected, and the tension of the eyeball would be greatly reduced, while in complete obliteration, necrosis of the whole intra-orbital contents would follow.

In the case of thrombosis, the obstruction is naturally slow and gradual, while in embolism the supply of blood is cut off suddenly. The delicacy of the ocular tissues makes them less capable of resisting prolonged want of blood supply, and the author, therefore, undertook a series of experiments by injecting the blood vessels in question, which all gave a harmonious result. These experiments on the dead body showed that both in the intact or opened cranium under a low pressure, when the ophthalmic artery is severed from the internal carotid, the vessels of *both* orbits can be filled in a very short period from the external carotid, or even from the facial artery. The experiments prove further that even under normal conditions the orbital vessels are not exclusively fed by the ophthalmic artery, but also by the external carotid and its branches. Hereby, the blood pressure and the velocity of the blood stream becomes equalised and more independent of the temporary state of individual branches, just as is the case with the circle of Willis for the brain.

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[1] *von Graefe's Archiv.*, xxxix., part i., p. 23. See also OPHTHALMIC REVIEW, vol. xii., p. 99, case 2.

There are no indisputable cases of pure embolism of the common carotid recorded, and the numberless cases of ligature of one and even of both common carotids were in the overwhelming majority not accompanied or followed by any ocular disturbances, and it must not be forgotten that ligature of the carotid is hardly ever performed under normal circulatory conditions; often an aneurysm is the cause for the ligature and a possible source for subsequent thrombosis, and secondary embolism.

Still more conclusive, because more easily controlled and observed, are the results of compression of the common carotid. Neither on himself nor on others has Elschnig been able in this way to produce any change in the circulation of the retina, nor any disturbance in its functions. Some such disturbance might have been anticipated, and, no doubt, is at times produced indirectly through the sudden decrease of the blood pressure which finds its expression in vertigo and fainting, while it may become a permanent and secondary result in those cases where, under specially unfavourable circumstances, serious anatomical lesions occur in the optical parts of the brain. K. G.

H. MAGNUS (Breslau). On the Behaviour of Foreign Bodies in the Lens. *Centralblatt für prakt. Augenh.*, 1893, *p.* 327.

In order to trace the way by which fluids traverse the lens, Magnus made a series of experiments on the eyes of rabbits. He injected mixtures coloured by various substances, such as chlorophyll, fuchsine, alcanine, and also lamp-black. In all cases the injections were made with due care as to asepsis, and the needle of a Pravaz' syringe was inserted 2 mm. behind the upper corneal margin, the point of the needle entering thereby the posterior surface of the lens immediately behind the equator in the vertical meridian. In one case described in detail, and illustrated by three woodcuts, a drop of a mixture of linseed oil and lamp-black was used. Immediately after the injection a narrow black segment was seen adjacent to the upper lens margin. The vertical canal of the injection had a narrow upper part filled with small black globules, while its lower club-shaped end, which did not quite reach the centre of the lens, showed two large egg-shaped black drops. No obscurity or other opacity could be observed in the lens, nor in the canal during the first twenty-four hours after the injection. On the third day the two large oval drops were quite colourless in their upper part, while their lower halves were as black as before, the explanation being that the black pigment had settled down in the drops of oil mixture, leaving the oil transparent in the upper part. It was further noticed that a number of minute globules lined the canal of injection, and the anterior surface of the lens was delicately dotted in the upper inner quadrant with minute spots, principally arranged along both sides of the vertical canal, and ending in a line parallel to, but not reaching the equator of the lens.

These drops were recognised as oil drops. Similar changes of the anterior lens surface were observed with other injection fluid; also in cases of feeding with naphthaline, analogous streaks have been found, but never could any colouring be discovered in these dots.

After remaining unchanged for several days, the spots gradually disappeared almost completely within a fortnight. They seemed to be small globules of oil from the mixture. Gradually the oil disappeared from the two large oval drops of the injected fluid. The black pigment alone was left behind, forming two shrunken masses somewhat cubic in shape, and with a mulberry surface.

The animal has been watched for two and-a-half years after the injection, and during all that time the lens has preserved its transparency, except at the posterior surface, where a thin circumscribed opacity marks the entrance of the needle.

Magnus comes to the following conclusions :—

(1) Solid insoluble particles remain in the lens, and are not eliminated, even when in so fine a state as in the case of lamp-black.

(2) The surrounding substance of the lens can remain permanently transparent.

(3) Fluid substances seem to be eliminated very quickly.

(4) The zone situated along the equator of the lens does not seem to take part in this elimination.

(5) The mode of exit of the injected oil does not speak in favour of preformed canaliculi in the lens. K. G.

CARL HESS (Leipzig). An Operation for the Relief of Ptosis. *Arch. f. Augenheilkunde, Bd. xxviii., Heft* 1.

Hess describes a method of operating upon cases of ptosis, congenital and paralytic, by which he has obtained recently very satisfactory results. He has employed this method in ten cases, in four of which other operations had been previously performed but without effect. All his ten cases were successful.

The following is a description of Hess's plan of procedure. The eyebrow having been shaved, a curvilinear incision (Fig 1, *a a*) is made in its whole length and following its curve, so that the scar may be hidden by the subsequent growth of hair. This incision is carried through the skin and subcutaneous tissue. Starting from this incision the skin of the upper eyelid is separated from the underlying layer of orbicularis palpebrarum, the dissection being carried down nearly to the ciliary margin, and practically along the whole length of the lid, as indicated by the dotted line in fig 1. Three silk sutures, each armed with two needles, are then required, one at the centre and one towards each end of the lid, and about half way between the eyebrow and the lid margin (fig 1, *b*).

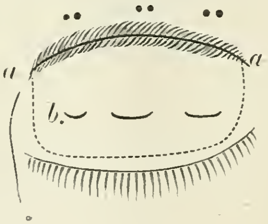

Fig. 1.

The needles are passed from without inwards, through the skin only, and are brought out in the space made by the previous dissection. The two needles of each thread are inserted about 5 mm. apart. When these stitches are pulled upon, the skin of the upper lid becomes folded on itself, the fold corresponding fairly accurately to that normally present in the lid. The needles are now passed deeply under the upper border of the incision in the brow, and brought out a few millimetres above it (fig 1). The two ends of each thread are tied over a small roll of sticking plaster [small pieces of rubber drainage tube are preferable, *Transl.*], the amount of traction necessary being gauged before the knots are made fast. The wound in the brow is united by a continuous suture. The stitches are left in for eight to ten days, and can, if necessary, be tightened from time to time.

Figs. 2 and 3 represent diagrammatically a section of the lid before and after the tightening of the sutures. In fig 2, *a á* indicate the points at which the needles are passed

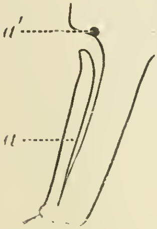

FIG. 2.

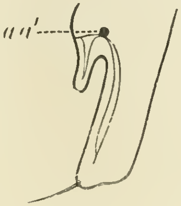

FIG. 3.

through the skin of the lid and brought out through the skin and subcutaneous tissues above the eyebrow. When the sutures are tightened these two points are closely approximated.

According to Hess, the dominant idea in his operation is that of obtaining an extensive raw surface by dissection, the cicatrisation of which will maintain the fold in the lid (and consequent shortening) produced by the tightening of the sutures. J. B. L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JANUARY 25, 1894.

D. ARGYLL ROBERTSON, M.D., F.R.S.E., President, in the Chair.

School Ophthalmia. — Mr. Jonathan Hutchinson called attention to this form of ophthalmia as having lately become very prevalent in a class of schools which had hitherto been free from it. It did not appear to differ in nature from the ophthalmia which had been long known to exist in workhouse schools. The affection in its first stage was characterised by a very mild and transient congestion of the eye; this was so slight in many cases as to be unnoticed. This stage was followed by an enlargement of the papillæ of the conjunctiva, which gave no trouble, and might remain unnoticed until the lids were markedly granular, and true trachoma or granular lids became established. In some schools only 5 per cent. of the children were affected; in others as many as 40 per cent. or 50 per cent. It spreads rapidily to the healthy, and had been known in one case to have spread in the family to which one of the pupils had returned in the holidays. It occurred under circumstances where no gross hygienic faults could be found, where all reasonable precautions had been taken except isolation, and where boracic acid had been used for the eyes; it was stated, however, that the upper eyelid had not been everted in applying the remedy. The characteristic feature of the affection was the very mild congestive stage, and the rapid taking on of the characters of trachoma with sago-grain bodies in the lids. The important question was one of diagnosis. Papillæ were constantly present in the conjunctiva as part of its normal structure, and the question of their enlargement was a difficult one to be sure of; the only safe rule in an epidemic was to treat all suspicious cases as real ones. Contrasting this disease with catarrhal ophthalmia, it would be found that the latter was never epidemic. It occurred in families, and might attack all the members of one family, it might attack another family by direct infection of one member of it, but its manifestations were very obvious; there was great redness of the eyes and discharge, and no schoolmaster would allow a child suffering from it to associate with other children. It was generally over in seven to ten days, and there was an end of it. In school ophthalmia it would be found that, notwithstanding repeated assertions to the contrary, crowding or other faulty hygienic surroundings did not predispose to its spreading, except from their increasing the risk of direct contagion. It appeared to spread especially in bedrooms, and more particularly between individuals occupying the same bed, suggesting direct contact, or possibly the intervention of flies. Without entering into the question of the alleged special micro-organism of trachoma. it might safely be said that school ophthalmia was due to a specific contagion conveyed from patient to patient; it was identical probably with military ophthalmia or Egyptian ophthalmia. These two latter were nothing but a severe type of granular lids. It was met with very infrequently in private practice, except in the Hebrew and Celtic races. As to the duration of treatment, if the disease were uncured it would continue to be communicated to others, inflicting on them the misery of enforced isolation, the pain and discomfort of treatment, and the risk of injury to sight. Among the English this disease rarely produces loss of sight, but too much stress should not be laid on racial immunity. No patient should be allowed to return to his fellows while a suspicion of the disease remained; this might mean in the severest cases isolation for the remainder of school life, as the disease was very tedious in its progress. The treatment should be complete isolation in separate schools, in which the instruction should be mainly oral; isolation of all suspicious cases from the first, fresh air, healthy surroundings, and a general tonic treatment should be prescribed in order to enable the patient to resist the advance of the disease; locally the application of mercuric chloride or silver nitrate. The school need not be broken up. Apart from the risk of conveying the disease home to others, probably better treatment would be secured by the patients all being treated by one skilled hand. The duration of the first or papillary stage of the disease is one or two months; that of the second, sago-grain stage, many months or years, varying with racial and individual peculiarity; in the latter case, the patients would probably never be fit for school again: they should be treated in invalid schools at the seaside.

Mr. Sydney Stephenson said that out of 11,000 children in the metropolitan pauper-schools, 2,000 required treatment for ophthalmia four years ago. At that time an isolation school to contain 400 children was erected, and he (the speaker) was placed in charge of it: in June, 1893, the number admitted was reduced to 100, so children from other districts were admitted, but the space was too limited to provide for all those requiring isolation and treatment in the metropolitan area. At first he regarded follicular disease as an early stage of trachoma, but he found he was mistaken; cases of follicular conjunctivitis did not develop. He had examined 14,000 children in different schools, excluding pauper schools, and found that 94.5 per cent. showed more or less follicular bodies in the lids, only 5 per cent. being free, while only 0.5 per cent. showed true trachoma.

After some remarks from Mr. Rockliffe, Mr. Nettleship said he did not consider there was a serious amount of disease of the lids in children attending the higher schools. In the best and oldest schools outbreaks of mild ophthalmia did occur, but these were not serious, and did not indicate that trachoma was making way in the country. Much of the apparent increase in this as in other diseases was due to the higher standard of health required, and to a more systematic examination of eyes, resulting in the discovery of cases which were formerly overlooked. If serious granular disease were increasing, cases of undoubted irritation or granulation would be seen in men who had passed through middle class schools, but such cases were very rare. It was often very difficult to say whether a lid was healthy or not; to determine this it was necessary to look out for variations in the condition; one of the most reliable signs, he thought, was the presence of a slight sticky discharge on the lids in the morning.

The discussion was adjourned.

Card Specimens.—The following were the Card Specimens: Mr. Ernest Clarke: Pulsating Exophthalmos in a child.—Mr. Kenneth Campbell: Sclerosis of Retinal Vessels.—Mr. Kingdon: Symmetrical Changes at the Macula in an Infant.—Mr. Lawford: Peculiar Cataracts in a Young Man.

ON A RARE FORM OF BULLOUS CONJUNCTIVITIS.

BY GEORGE A. BERRY.

THE following case seems worth recording. Though in many respects incomplete, attention is called to it, as possibly others might have opportunities of observing more closely all the different stages of a process which is no doubt of very rare occurrence :—

Mrs. J., aged 47, complained of discomfort, &c., in the eyes after reading for a short time. The nature of the subjective symptoms suggested a chronic form of congestion or inflammation of the conjunctiva, and possibly the necessity for some change of glasses. She was slightly myopic (0.5) and required + 2.0 for reading, and presented therefore a rather higher degree of presbyopia than is usual at her age.

About one-third of the tarsal surface of the conjunctiva of each upper eyelid was occupied by a marked, and beautifully, though somewhat irregularly *stellate cicatrix*. These cicatrices were seen to be superficial and only slightly puckered at their centres. The history was that a year previously the lids had been much swollen and painful for three weeks, during part of which time the patient could feel with her finger little "bladders" lying under them. The treatment adopted at the time was to bathe with some mild antiseptic lotion and to drop in a solution of cocaine. This attack in the eyelids occurred contemporaneously with an eruption on the face and shoulders, which her medical attendant, Dr. J. Playfair, and also Dr. Allan Jamieson, pronounced to be *dermatitis herpetiformis*.

Dr. Jamieson, who, as is well known, is an authority on skin diseases, assures me that there could be absolutely no doubt as to the diagnosis.

The first attack of this peculiar skin eruption had occurred two years previously on the legs and body generally. This had been followed at intervals by others, lasting as a rule from three to five weeks, but the occasion above referred to was the only one on which the eyelids were affected. At the time of my examination there were a few similar though perhaps rather more puckered scars in the mouth (mucous membrane of the lips). I afterwards heard from Dr. Playfair that during one attack bullæ had formed in the vagina, which had left scars. There were, on the other hand, no scars in the skin.

The appearance of the conjunctival cicatrices was altogether different from anything else I have seen, and notably different from those caused by *pemphigus conjunctivæ*, four cases of which have occurred in my practice. They differed from the pemphigus scars in their shape and density, being much more superficial. Whether their limitation to the tarsal surface of the conjunctiva is a general rule which might further distinguish them, or not, is a point which a single example of the affection and a single occurrence of the bullæ can hardly justify one in expressing an opinion on. In view, however, of the possibility of other cases being observed, this point might be attended to.

It seems to me undoubted that the case described is an example of *a definite and rare form of bullous conjunctivitis.*

As to the prognosis: recurrent attacks of dermatitis herpetiformis appear to be the rule, and no doubt recurrence might be expected in the conjunctiva as well as elsewhere, but if the result of one attack is not usually more serious than in the case of Mrs. J., the prognosis could hardly be considered anything but favourable.

ON BLINDING OF THE RETINA BY DIRECT SUNLIGHT. A STUDY IN PROGNOSIS.

BY GEORGE MACKAY, M.D., F.R.C.S.E.

ASSISTANT OPHTHALMIC SURGEON TO THE ROYAL INFIRMARY,
EDINBURGH.

(*Continued from page* 57.)

PART III.

Experiments on Animals.

Two sets of experiments have been made by Czerny[1] (on frogs, birds and rabbits), and by Deutschmann[2] (on rabbits), for the special purpose of studying the lesion produced by direct sunlight. They employed similar apparatus, and their results agree very closely.

When the direct rays of the sun, condensed by a concave mirror, and then rendered parallel by a convex lens, had been allowed to enter the dilated pupil of a rabbit for a few seconds, Deutschmann found that the part of the retina on which the rays had been focussed could be seen with the ophthalmoscope to present a silvery white patch in a grey area, surrounded by a dark brown-red border, the affected area measuring from one to two optic disc breadths. Changes slowly took place in the injured part, so that in the course of a few days the central spot became dark grey, while the periphery exhibited a whitish reflex surrounded by a yellowish zone. Finally, the spots exhibited a small black centre with a broad yellow-white border. This stage was reached at latest in three weeks, and thereafter no further ophthalmoscopic change occurred.

On further investigation it appeared that the primary white central spot was due to coagulation of the albuminous constituents of the retina. On microscopic examination of frogs' eyes removed *immediately after* the experiment and placed in preserving fluid, Czerny found that the pigment-laden processes of the hexagonal epithelial cells had extended between the rods and cones as far as the external limiting membrane, and that the outer parts of the rods were somewhat curved, and on their concave sides frayed.

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[1] Czerny, "Ueber Blendung der Netzhaut durch Sonnenlicht." Sitzungsbericht der Weiner Acad., Bd. lvi., Abth. 2, 1867.

[2] Deutschmann, *v. Graefe's Archiv.*, Bd. xxviii., Abth. 3, S. 241, 1883.

In a frog's eye excised *three days after* the exposure and placed in preserving fluid, Czerny found complete destruction of the outer portion of the rods and masses of pigment carried into the outer nuclear layer, while the pigment epithelium in the parts surrounding the blinded spot showed a rich proliferation. There was also exudation between the retina and choroid.

In the final stage a cicatricial formation of pigmented connective tissue took place in the outer part of the retina, and an atrophic thinning of the subjacent choroid. Analogous appearances were found in rabbits.

Deutschmann produced more complete disorganisation of the cellular structure of the retina at the centre of the injured area, while the choroid in the neighbourhood showed widely distended vessels and some hæmorrhages. The final appearances were those of atrophy and pigmentation as described by Czerny.

Both observers satisfied themselves that shutting off the *invisible* heat rays did not prevent the injury, and the intervention of the darkest "grey" or "blue" glasses had also little effect.

Both failed to produce any permanent injury by focussing gaslight on the retina.

These experiments considerably overstepped the mark, so far as the clinical features in man are concerned, for, as Czerny himself remarks, the beam of light was sufficiently strong to raise a blister readily on the skin, and the dilated pupil permitted the entrance of a much larger beam than would be possible in a healthy human being, with an active pupil and a disposition to narrow the palpebral aperture when gazing at a bright light. There is no record of any microscopic study of a sun-produced lesion in man.

The Nature of the Injury clinically considered.—The first retinal function which is modified by a sunlight injury to the human eye is *the capacity for observing after images* at the affected part. The actual physiological visual disturbance, which succeeds a momentary glance at the sun, has been carefully studied by Fechner, Aubert,[1] and others. The common experience is that the after-image thus obtained undergoes a series of changes in colour, which follow one another at intervals of a few seconds, and that they vary in character according as the eye is kept open and exposed to diffuse daylight, or directed to a white or a black surface, or is altogether excluded from light. The whole phenomenon seldom lasts more than a few minutes, and its disappearance is followed by a prompt recovery of the normal retinal function.

So long as we are ignorant of the nature of the process by which light waves are converted into visual sensations, one can offer no explanation of the mechanism concerned in producing an after-image. The persistence or re-appearance, on closure of the eye, of *a sun image which does not rapidly undergo alterations in colour*, may perhaps be taken (save in the colour-blind!) as the mark of a retinal stimulation which has slightly surpassed the physiological limit. It was a marked feature in my last three patients. There is one aspect in which it may, perhaps, be taken as a hopeful sign, namely, as an indication of cellular vitality at the injured part, for it seems fair to assume that this sensation could not be maintained from a group of end organs which had undergone coagulation or profound disorganisation.

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[1] Aubert, "Physiologie der Netzhaut," p. 372.

I have reason to believe that in some cases the persistence of the sun image for a day or two is the sole disturbance. But in the series of cases under consideration, the injury has resulted in more than an after-image. It has generally been stated (if mentioned at all) that the visual defect was felt immediately after the exposure. The sun image ("persistence of the impression") usually is seen, but not always; it may re-appear after an interval. From particular inquiry it appeared, in most of my own cases, that an interval of two or more hours elapsed before the more permanent positive scotoma was felt, *e.g.*, Cases I., III., IV. V., even though the patient read and ought to have noticed it, as in I. and IV. In Case I., the change from daylight to artificial light, in Case III., from daylight to twilight, revealed the defect, probably on account of the injured part being incapable of "adaptation." There can be little doubt that this function is largely subserved by the protoplasmic movements of the hexagonal epithelial cell processes, and of the cones themselves, which take place when light acts upon the retinæ. Under ordinary circumstances, the sheathing movement of the pigmented processes must supply a natural safeguard to the percipient elements. But the mechanism is not instantaneous in action, and the protection is limited. A maximal extrusion of the pigment requires several minutes, at least, for full development.

Given sufficient time, many persons can look at the sun when considerably above the horizon, and, indeed, the earliest observers of sun spots, who were unprovided with modern protective apparatus, give some quaint descriptions of how this may best be done.[1] But a light stimulus, which at first caused confusion and distress, may either paralyse the protoplasmic movement, or so exhaust the percipient and adaptive elements as to induce a false sense of security, while actually producing serious injury. Herein lies the danger of continued observation. Probably the grey scotoma, which usually succeeds the primary after-image, does not appear, in some cases, till capillary exudation has taken place into the retinal tissue in front of the cones. Hence the delay in its recognition. In other cases the chief plane of injury may be anterior to the cones.

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[1] See in Brewster, "Martyrs of Science," footnote, p. 45, quotations from Fabricius, Harriot and Scheiner.

It is an unfortunate characteristic of this affection that *the injured eye is usually that one which had previously the acuter vision*, the observer naturally employing his best eye in order to secure the best view. As regards *the degree of impairment of direct vision*, the greatest defect (excluding Jaeger's two very exceptional cases, p. 7) has been recorded by Dufour, in a man who, four days after the exposure, had R. V. = $\frac{1}{20}$ (p. 12). He had presumably enjoyed good vision in this eye previously, for in three weeks V. rose to = $\frac{1}{2}$. Beyond that it never improved. More frequently the primary reduction has been to V. = $\frac{1}{3}$, or $\frac{1}{2}$, or $\frac{2}{3}$ of the normal.

An accurate estimate of the injury is not so easily obtained by the ordinary type test as one might expect, for the affected area is so minute that the patient can usually, with a little care, direct his eye in such a way as to receive the image on an uninjured part of the fovea or neighbouring macula, and thus partly evade the test.

It becomes all the more important to measure the scotoma, and estimate the defect quantitatively. I cannot but think that the failure of some observers to map out the scotoma arose from seeking it at too short a distance from the eye. In all my patients a distance of one metre gave a sufficiently large projection for its ready recognition on a white surface. The dimensions of the scotomata hitherto found will be referred to later.

The state of the colour sense at the injured part has not received much attention. The scotoma is positive, and has generally been projected as a "grey spot;" sometimes as a "luminous disc," or "revolving star." In two of my cases (III. and IV.) it seemed "greenish," in the latter "reddish" for some days before becoming grey.

On examining for colour perception, two cases of Deutschmann's showed complete loss in the scotoma; one of Bock's could distinguish light colours but not dark ones; to two other patients all colours appeared covered with brown, but their visual defect for test type was considerably greater than in the three previously mentioned.

My own observations only justify the conclusion that the defect for colours extends over a larger area, and is more profound than for white. It may be absolute at one part and partial throughout the remainder. As I am not satisfied that the test colours at my command were of equal saturation or luminosity, I shall assert nothing about their relative imperceptibility. Is it possible that we could have a sun-produced retinal lesion so delicate as to interfere with the perception of one fundamental colour sensation without affecting all? I am acquainted with a very distinguished English physicist who, in his youth, was the victim of an eclipse observation, to which he attributes a marked impairment of the power of perceiving yellow with the injured eye, which he is confident did not previously exist, and is (or was for many years) the only function disturbed. The question is of considerable interest in relation to the problem of colour perception.

The "revolving movement" and the "oscillation" complained of by some patients are curious accompaniments of the scotoma for which no satisfactory explanation has yet been given. Emmert,[1] in speaking of the oscillating sensation, stated (after Angelucci) that the pigment granules oscillate between the cones under the influence of light, and suggested that an abnormal intensity of these oscillations, and an extension of them to layers which they should not reach, may account for the sensation. He mentioned the occurrence of similar oscillations in a case in which a hæmorrhage at the macula was undergoing absorption. He further suggested that they might arise like scintillating scotoma, as a reflex disturbance in the cerebral tissue referred to the macular fibres. The movement was so rapid, or so momentary that my three patients (Cases II., III., and V.), who experienced it, were unable to give any detailed description.

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[1] Emmert, *loc. cit.*

The account given by one of Stigell's patients (Case I., p. 11, a medical student), suggests a vascular connection, namely, the entoptic perception of retinal vessels, but does not elucidate the rotatory movement. It seems to me that the so-called "rotation" must be really an oscillation of sufficient rapidity to produce an optical illusion, and that it may be due to an actual quivering of some retinal cones, which as a result of the injury have lost their proper support.

Whatever be the true explanation, the important point is that the symptom is usually very persistent, and constitutes a factor to be reckoned with in framing a prognosis. In my Cases III. and V., it was still noted two and a-half and one and a-half years respectively after the accident occurred. It has not been recorded in any case where V. was poorer than $= \frac{1}{3}$.

As to the *ophthalmoscopic appearances*, it is not surprising that the result has been negative in many cases. The diameter of the fovea centralis varies from 0.2—0.4 mm. Let us take 0.3 mm. as an average. An object 2 cm. in diameter at one metre's distance would, in an emmetropic eye, produce an image just filling the fovea. It follows that in an emmetrope, if a scotoma has a diameter of less than 2 cm. when projected to one metre's distance, we may conclude that the lesion affects a retinal area less than the size of the fovea.

In one of Deutschmann's cases (p. 18), the scotoma only measured 5 mm. at one metre's distance, and can therefore only have occupied a quarter of the fovea.

In Swanzy's second case it must have measured barely 10 mm. at one metre.

In Deutschmann's third case barely 15 mm. at one metre.

In Deutschmann's fourth case barely 15-17 mm. at one metre.

In Sulzer's fourth case barely 23.3 by 10 mm. at one metre.

In my own cases the scotomata have varied from a minimum of 3 mm. to a maximum of about 20 mm. in diameter. Bock has described a much larger one (= 10 cm. at one metre), but without visible change in the fundus. It is evident that extensive ophthalmoscopic changes are not the rule, and it is by no means easy to make accurate word pictures of such as do occur, or to be confident of the extent of the departure from the normal. In a case seen *within the first week*, if the lesion be limited to the fovea and be slight, only a little flattening and loss of its light reflex is likely to be found. If the injury be a little more severe there may be found within the fovea or at the side of the fovea (if the patient has fixed the lunar surface), a little spot of pale orange tint, presumably due to a minute choroido-retinal exudation. There will probably be some pigmentary darkening of the adjacent fundus which may in severer cases assume a reddish hue surrounding a buffy grey spot.

During the second week there is a tendency towards increase of pigmentation from proliferation of hexagonal epithelium, and this may replace or obscure the signs of exudation (Case I.).

In from three weeks to one month the fundus may appear quite normal. It was so even in Dufour's case (p. 12). If anything abnormal is seen later, it is likely to be a darkening of tint at the seat of injury, but even this seems to have been seldom present six months after the accident.

While in every case there is, doubtless, super-heating of the retinal tissue, and possibly a microscopic coagulation of its albuminous constituents at the most injured area, a silvery white spot, such as was produced by Czerny and Deutschmann in their experiments, has not yet been found clinically.

Evidence of increased vascularity, reddening of the optic disc, or dilation and sinuosity of retinal vessels at the macula, is sometimes found, but is not a marked feature.[1]

While this is true of the immediate injury, it must be borne in mind that the after history of these cases of sunlight injury has not been followed up for any great length of time. Deutschmann, who was impressed by the similarity of the final appearances of the atrophic spots produced experimentally in the fundi of rabbits with those found in patches of disseminate choroiditis

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[1] This deserves comment, because two or three cases have been recorded where a sudden flash of reflected sunlight seems to have been followed by greater reaction. I refer to cases by Jaeger, Snell and Gillott.

A healthy, "blooming maiden" of 18, while bathing in a lake one hot summer day, received for a moment on her left eye the blazing reflection of the sun from the surface of the water; she felt blinded at once and had severe pain; some moderate inflammatory symptoms followed. When Jaeger[*] first saw her six months later the external appearance was natural, but the eye was quite blind. Though he published this case in 1854, he does not say whether he examined the eye with the ophthalmoscope.

Snell[†] has published a case of retinitis in one eye of a healthy girl, believed to be caused by a boy who was passing in the street playing with a sun reflector, and sending a sudden flash of light into her eye. External inflammation was not present, but there was "cloudiness of the retina and veiling of the vessels about the disc and macula." V. = J. 20. She was treated with small doses of perchloride of mercury and coloured spectacles, and soon got quite well. The case was really under the care in human eyes, drew attention to the probability of this latter condition being, in some cases, caused by exposure to bright light. I have purposely refrained from a hasty publication of my cases, in order to allow some time for sequelæ. The only contribution that I can offer is presented in Case I.[1]

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[*] Jaeger, *loc. cit.*, p. 74.

[†] Snell, Ophthalmic Review, 1883, p. 141.

Metamorphopsia.—Since Reid's original observation in 1761, the presence of this symptom received no mention in these cases until Swanzy noted it in both of his patients. Snell found it also. Only one of my patients complained of it spontaneously in a modified form (Case VI.). I regret very much that it did not occur to me to examine for this condition systematically at an early stage. Macropsia is present now, as a sequel to the accident, in four of my patients; micropsia in one, and the test for it has demonstrated better than any other means the permanence of the injury. Indeed, judged by this standard, only one of my patients has recovered perfectly; possibly he never had metamorphopsia.

The Prognosis.—It is not easy to conceive of a patho-

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of Mr. Gillott, who said that he had seen "just such a one in a young man from looking at the sun in the course of an eclipse."

The ocular symptoms which, as is well known, often afflict travellers exposed to the reflection of the sun from sandy deserts or snow-clad wastes,[*] seem to be mainly photophobia, lacrymation, pain, and such manifestations referable to irritation of the branches of the fifth nerve, with only moderate vascular engorgement of the superficial vessels of the eye, and unaccompanied by inflammation of the deeper structures. This appears also to be true of the effect of electric light upon the eye.[†] But the tendency to erythema of the skin of the face, or any part exposed to the solar or electrical radiations, leads one to suspect that it is the protective action of the lids which saves the eyes from marked vascular disturbance. It is noteworthy again that Little[‡] has reported a case of slight retinitis following a *sudden* flash from an electric light at close quarters.

[1] In this connection, Mr. Nettleship's paper in the OPHTHALMIC REVIEW, for February, 1888, p. 33, deserves mention.

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[*] Reich, *von Graefe's Archiv.*, xxvi., p. 135, 1880; also OPHTHALMIC REVIEW, 1883, p. 109-110.

[†] Emrys Jones, OPHTHALMIC REVIEW. 1883, pp. 106-108.

[‡] Little, OPHTHALMIC REVIEW, 1883, p. 197.

logical condition which affords a better field for the study of accurate prognosis than the subject of this paper. If any apology is required for its length and detailed fulness, I hope it may be found in this consideration. An aseptic irritant is applied, at and for a known time, to a highly sensitive surface, which is capable of recording its perturbation with almost mathematical precision. The lack of precise knowledge of the actual strength of the stimulus, perhaps of the exact duration of its application, and the tissue resistance of the recipient, is counterbalanced by the facility of observing the lesion, and estimating the visual defect.

The *prognosis* for a decided improvement in vision and a practical cessation of discomfort is on the whole favourable. But complete recovery, even in cases of only slight failure for test-type (*e.g.*, V. $= \frac{6}{6}$ eccentrically), is exceptional if investigated by sufficiently refined methods.

Of the recorded cases several unfortunately have not been seen a second time; others have ceased to report themselves after a few days, or have only returned after an interval of months, making it impossible to assign the actual rate of progress or date of recovery.

We have already considered most of the data for prognosis. I may briefly summarise them: (1) the time which has elapsed since the accident; (2) the degree of impairment of visual acuteness for test-type and for colours; (3) the extent of the scotoma and especially of the absolute area contained within it; (4) the gravity of the ophthalmoscopic changes; (5) the presence or absence of oscillating movement; (6) of metamorphopsia; and (7) the local and general healthiness of the subject. To these might be added: (8) the refraction of the eye; and (9) the natural pigmentation of the fundus. An uncorrected ametropia and a fundus rich in pigment may confer some protection.

If I venture to lay down some rough guiding lines based on the scanty records of past experience, it is only in the hope that more persevering observation in future may be directed to their improvement or demolition. The most hopeful period is certainly during the first month. Supposing the eye to have been previously healthy and possessed of normal vision (the assumption is justified largely by experience) we may roughly divide all cases into four classes, with reference to their probable prognosis, thus:—

Class I.—A patient with V. = $\frac{1}{3}$ or better in *the first week* (and the earlier the better), has a good chance of practical recovery in one month.

Class II.—A patient with V. = $\frac{1}{3}$ in *the second week* has a fair chance of practical recovery in three or four months. One with less defect at this period will have a better chance (he may come under Class I.); it will depend on the *intensity* of the retinal defect.

Class III.—A patient with V. = $\frac{1}{3}$ in *the third week* will probably recover slowly in five or six months, but the chances are rather against his complete restoration.

Class IV.—A patient with V. which is poorer than $\frac{1}{3}$ at any time, though he may make rapid progress in the first month, seems to have a bad chance of recovering V. = $\frac{6}{6}$. *Hitherto no case with V. poorer than* $\frac{1}{3}$ *has regained* $\frac{6}{6}$. By "practical recovery" I mean cessation of obtrusive defect.

The treatment ought to be preventive; smoked and coloured glasses of the feeble shades ordinarily used are quite insufficient. Astronomers have learnt to avoid the risks which the laity rashly incur. By reflection or refraction only a fractional part of the solar beam is permitted to enter the eye through a dark glass. By one device a piece of glass is placed within the focus of the telescopic eye-piece at an angle of 45° to the axis of the tube. Its anterior surface is plane, its posterior inclined to the former. The image from the first surface representing only about 5 per cent. of the light is reflected through an eye-piece placed laterally at right angles to the axis of the tube of the telescope; 95 per cent. of the light is refracted out of view. This is the principle of Sir John Herschel's eye-piece.[1] Another method depends on the use of a pair of Nicol's prisms.

The chief difficulty hitherto in advising the ordinary person has consisted in the absence of any proper standard smoked glass in terms of which the tint of a dark glass could be expressed. Neutral tint glasses are certainly preferable to coloured ones, but considerable differences exist in the grading of these glasses as supplied by opticians, and the most deeply tinted are not free from colour of varying hue. I am hopeful that Mr. Lovibond's[2] "tintometer" may help to a solution of this difficulty to which I have drawn his attention. My own experience is that a glass *so dark that no object illuminated by diffuse daylight is visible through it*, must at least be used if one would view even the January sun with impunity. One should also give time for gradual adaptation of the retina, and test the suitability of the glass by looking through it first at the sky near the sun, and so soon as one has looked directly at the sun for a second or two it is well to look away altogether, and see if there is any persistence of the impression. If any is found, the tint of the glass must be deepened.

As to the treatment to be adopted after the injury is done, I think that the protection of the eyes from great alterations of light by the constant use of dark glasses (No. 3 London smoke, with side pieces), and rest from eye work during the first month, with attention to general health, is all that is indicated. If inflammatory symptoms threaten, diaphoretics and confinement to a darkened room, as happily practised by Deutschmann.

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[1] Young, "On the Sun," International Scientific Series, chap. ii.

[2] J. W. Lovibond, "Measurement of Light and Colour Sensations." London: George Gill & Sons.

The use of strychnine hypodermically, or galvanism, seems to have little foundation in theory or fact. Cases have improved as much and as rapidly without as with either.

N.B.—In Fig. 1, p. 42, a curved dark line is shown traversing the shaded area in the 5 mm. and 1 cm. discs. This is an error in engraving; the shading should have been quite uniform as in the 2 cm. disc.

B. R. GEPNER, Jr. (Warsaw). On Subconjunctival Injection of Corrosive Sublimate Solution. *Centralblatt für praktische Augenheilkunde, Jan.*, 1894.

Gepner complains that this plan of treatment has fallen into a disuse quite unmerited, for anyone who makes trial of it with his mind unbiassed will find it a very good and a very safe method, its value being none the less that it is just in those cases in which other modes of treatment fail of success, that it seems to be of most use. He considers the indications for its employment very simple: he has used it in all cases in which he might look for good from the antiseptic action of corrosive sublimate, that is, in all acute forms of inflammation of cornea and iris, and chiefly where one desires a general mercurial treatment.

(*a*) *Cornea.*—We have often to deal with various diseases of the cornea, in which there is certainly or probably a local infection. Where a severe destructive process in the cornea has followed a slight abrasion, in presence of a chronic dacryocystitis, there is no question as to a septic infection; closer examination might show a similar cause at work in all, or nearly all, corneal ulcerations, and in such cases it is reasonable to look for good results from the antiseptic action of corrosive sublimate. Gepner here gives notes of several cases which he treated by means of subconjunctival injection.

Case I.—Central ulcer of right cornea with hypopyon. A. C. one-third full of pus, no disease of sac. Other treatment being unsuccessful during three weeks, C. S. I.[1] was resorted to. Next day, pain was gone, pus was much reduced in quantity, and disappeared entirely in four days; by the end of a week the ulcer was almost healed.

Case II.—Left cornea injured a week ago by a spark of iron, necrotic ulcer; A. C. half full of pus. C. S. I. followed by disappearance of pus within eight days. It is in such cases that C. S. I. acts most efficiently.

Case III.—Injury to cornea and lens of left eye, prolapse of iris through the wound, in which lay a splinter of iron; severe headache, much vascular injection of the ocular conjunctiva. Gepner first saw the patient one hour after the injury, the eye being bound up with a piece of soiled linen; he cleansed the wound, removed the foreign body, and the prolapsed portion of iris along with some of the lens matter. Next day the eye was painful, corneal wound infiltrated, whitish-yellow shreds lying on the iris: hypopyon, C. S. I. The same evening the headache was gone and next day there was no hypopyon. In three days the iritis was no longer purulent and the wound nearly healed. This eye was thus apparently saved from a threatened panophthalmitis by a timely injection.

Case IV.—A peasant, whose right eye was operated on three years ago for cataract by extraction, with iridectomy; iridocyclitis had followed the operation, but a successful iridotomy had been performed. Four days after Gepner (senior) had extracted the lens from the left eye with iridectomy, iritis set in with deep A. C., tenderness to touch, a few rounded areas of infiltration at the margins of the coloboma, and hypopyon—a purulent iridocyclitis. C. S. I. was productive of diminution of symptoms in twenty-four hours; a second injection was made and eventually the eye recovered with V. = $\frac{5}{50}$.

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[1] C.S.I.—Subconjunctival injection of corrosive sublimate solution.

Case V.—Globe injured by a particle of iron. A wound at corneal margin with infiltrated edges, the whole cornea slightly dim, whitish flecks in the aqueous falling to foot of A. C., and partially concealing the pupil, which was drawn downwards and inwards. In the iris the particle of metal was lying embedded. Conjunctiva much injected, globe not tender to touch. The foreign body was removed, the prolapse replaced, C. S. I.; the wound healed in forty-eight hours; in ten days V. = $\frac{5}{10}-\frac{}{8}$

Case VI.—A patient who came a week after receipt of an injury; inflammatory symptoms present, with traumatic cataract, hypopyon, hazy cornea which showed a small infiltrated wound, in which lay a piece of metal. This splinter, 11 mm. in length, was removed as well as a portion of iris and most of the lens. C. S. I., eventually V. = $\frac{1}{10}-\frac{}{8}$ with a lens, in spite of opacity in cornea.

Interstitial keratitis is syphilitic in origin in the great majority of cases if not in all, and one might accordingly expect to get benefit from C. S. I. in this disease; but in only one case out of nine did any good come of even somewhat prolonged treatment, and in that one case the improvement, though distinct, was very slight. After injection, however, any posterior synechiæ yielded much more readily under the use of atropine.

C. S. I. appeared to be of use in one case of Stellwag's keratitis punctata in which it was employed.

(*b*) *Sclerotic.*—*Case VII.*—Frau K., scleritis of left eye, no dyscrasia; after failure of other treatment, one-third of the circumference of the cornea being involved in the disease, C. S. I. used twice; the advance of the disease was at once checked; after eight injections complete healing took place, and no recurrence had taken place for eight months.

(*c*) *Iris.*—As well as in cases of purulent iritis of traumatic origin as above indicated, Gepner has used C. S. I. in cases of idiopathic and syphilitic iritis.

Case VIII.—Herr I., idiopathic iritis, which had been going on for two months previously; pupil small and almost completely bound down. Atropine failing to produce dilatation of the pupil in three weeks; during which salicylate of soda was administered, C. S. I. was employed, and was followed by great relief of symptoms, with partial dilatation of the pupil. C. S. I. was repeated after a few days, with the result that complete convalescence at once took place, V. = $\frac{5}{10}$. A fortnight later, traces of former posterior synechiæ were the only evidences of the severe inflammation which had so recently occurred.

Case IX.—Iritis, probably not syphilitic; pupil slightly dilated under atropine, covered with greyish white exudation, some hypopyon. Patient had already been four weeks under treatment. C. S. I.; next day pain was gone; in forty-eight hours there was no trace of pus; C. S. I. repeated, and in a week the eye was well.

In a few cases of distinctly syphilitic iritis, C. S. I. has proved very useful; thus a gumma disappeared in ten days after two injections; in another case of very severe iritis resisting all other treatment, a complete cure was brought about by ten injections (!)

(*d*) *Internal Coats of Eye.*—In several cases of old-standing choroiditis, injections have led to decided, though slight, improvement in sight. The patients were not sufficiently long under treatment, since after one or two painful injections they failed to reappear. In some cases of myopia with fundal changes, benefit has been obtained.

Case X.—Frau M., aged 40, myopia of 7D., with choroido-retinitis, and troublesome muscæ; three injections caused disappearance of the muscæ, made reading easier, and improved the vision from $\frac{5}{36}$ to $\frac{5}{15}$.

Case XI.—Myopia of 9D., with choroidal changes; by recent retinal hæmorrhages, vision had been reduced from $\frac{5}{15}$ to $\frac{5}{200}$, and that with —18D. Two days after C. S. I. in left eye, V. with —11D. = $\frac{5}{36}$ (!) After two injections in right eye and one in left eye, the state of affairs was V.: R. = $\frac{5}{18}$ with —16D., L. = $\frac{5}{80}$ with —13D.; and that this was not due to absorption of the retinal hæmorrhages is shown by the fact that the former ophthalmoscopic appearances had remained quite unchanged. Four months later, the vision having again diminished, injections were repeated. In four weeks three injections of C. S. and two of "Physiological Salt Solution" were carried out, with a final result to vision of R. with —12D. = $\frac{5}{18}$ L. with—10D. = $\frac{5}{10-8}$. All the cases of myopia with fundal changes, to the number of twenty, treated in this way showed greater or less improvement except two. Reading became easier, and the troublesome muscæ disappeared.

Retinitis Pigmentosa.—A deaf mute, aged 34, whose parents were near relatives, noticed that within a few weeks his sight, always indifferent, had become much worse; he could no longer read or write. This was explained by the advance of a posterior polar cataract secondary to a typical, nonsyphilitic retinitis pigmentosa. Fourteen days after C. S. I. vision had improved from $\frac{5}{30}$ to $\frac{5}{15}$; and patient believed that he had never seen so well in his life before.

The subconjunctival injection of corrosive sublimate solution, though productive of great benefit in so many and so varied diseases of the eye, is not however to be regarded as a "panacea for all woes;" still Gepner thinks it a method of so decidedly promising a character, that its use seems called for in many similar cases. It is true that before Darier's suggestion was brought before the profession, iritis, hypopyon, &c., were cured, but the improvement was never so sure or so rapid as when injections are used (compare Cases I. and VI.).

Such results as those above narrated seem to leave no doubt as to the real value of this method. Though sublimate forms albuminates in the lymph paths, part of the fluid probably spreads through the tissues and acts directly upon the disease germs, destroying them or diminishing their resistance. This method of treatment has the great advantage over others of curtailing the duration of the disease, and therefore has great claims upon our attention.

All Gepner's cases, however, were not so successful as those mentioned above, *e.g.*, one of hypopyon filling one half of the A. C. received no benefit from three injections. He then performed paracentesis, injected once more, and rapid healing followed. He considers that cases bad enough to require paracentesis would derive benefit from injection, in addition. In a case of penetrating wound of cornea, iris, and lens, the purulent iritis which followed went from bad to worse in spite of three injections. The cornea was then incised, and the pus removed from the A. C., which was then thoroughly washed out with warm boric lotion. A yellow clot which still remained was removed with iris forceps, and found to be the slough of the capsule of the lens. Some of the lens matter was extracted with a scoop, the A. C. again washed out, and C. S. I. given: healing took place with rapidity. The C. S. I. when used alone had not checked the purulent process, but (in Gepner's opinion) must have assisted in bringing about so good a final result—for the patient retained light perception and projection.

Darier was not content with employing C. S. I. to check an infection or suppuration already begun; he used the method also prophylactically. Not only did he inject in all cases of deep injury to the globe, but even in his cataract operations he introduced subconjunctivally, immediately before making the incision, a mixture of corrosive sublimate, eserin and cocain. In severe, but not actually destructive, wounds of the eye, Gepner uses C. S. I. also, giving two reasons for so doing, the risks namely of immediate infection, and of subsequent sympathetic inflammation. He admits, however, that there is as yet no evidence that C. S. I. has any influence as regards sympathetic ophthalmia. He does not employ the method prior to ordinary operations, however, partly because we can with so great certainty exclude any infection, partly because the "injection" is painful, often very painful, and the patient is apt in consequence to be unsteady, to squeeze the eyelids together, and in other ways to behave so as not to facilitate healing.

Next to cases of corneal injury and inflammation, the most suitable cases for C. S. I. are those of obstinate iritis, especially those in which there is pus in the anterior chamber, and where the ordinary modes of treatment have proved unavailing. In these the influence of an injection in promoting dilatation of the pupil is often very marked and very interesting; a pupil which has resisted free, abundant use of atropine, will often yield and dilate within twenty-four hours after an injection has been given.

Another class of case which receives benefit from C. S. I. is that of amblyopia from atrophic and inflammatory changes in myopic eyes. Rapid and decided improvement follows injection; and even where this does not occur, and where vision is not recovered to any material extent, the patients always experience gratification at the relief from troublesome muscæ volitantes.

But how is one to explain the beneficial action in those cases in which the germicidal effect is not the reason, as for example, the cases of myopia and retinitis pigmentosa? One must exclude any idea of a specific action on the retina by corrosive sublimate, as is the case with strychnine, since Pflüger obtained good results by the injection of iodide of potassium in place of the mercurial salt. Perhaps corrosive sublimate acts as an antiplastic, a solvent, stimulating the reabsorption of the inflammatory products, and thus improving the circulation and the nourishment of the retina. To settle whether it were not the simple injection of a fluid which produced benefit, Gepner injected a solution of "physiological salt," and found that the results were by no means so satisfactory as with corrosive sublimate.

Method and Dose.—The usual hypodermic syringe may be employed, but one provided with a flattened needle—like a discission needle—is better, and if made of "iridised platinum," may be sterilized in a flame before use. Gepner adheres to Darier's prescription and injects $\frac{1}{20}$ mg. of the salt (0.00005 g.) at one sitting, making the puncture about one cm. from the corneal margin, the eye being under cocain. The fluid is then dissipated under the conjunctiva by gentle friction. A varying degree of pain follows the injection, sometimes pretty severe. Next day the eye is much reddened, the conjunctiva swollen, with hæmorrhages near the needle wound, but the pain is gone, and after three or four days the eye is sufficiently recovered to permit a second injection. The only complication which Gepner has ever seen to occur is the formation of a small bluish scar at the spot of injection, so the procedure appears perfectly safe. It may be taken, as a rule, that in an acute inflammatory condition, we are to be guided as to repetition by the effect of the first injection; while in a chronic case, if no benefit follows a second or a third injection, it is useless to proceed further.

It is necessary to add that in the cases above recorded no subcutaneous "general" treatment was employed; each was a pure experiment on the value of local injection. We must wait for more observations and more information before we decide as to the real scope and reliability of the method.

W. G. Sym.

H. MAGNUS (Breslau). Contribution to the Etiology of Nystagmus. *Centralblatt für prakt. Augenh.*, 1893, *p.* 361.

In support of the theory that miners' nystagmus is due to the over-exertion of the upward rotation of the eyeballs, Magnus describes a well-observed case which, as he says, has almost the weight of an experiment.

An infant girl, 10 weeks old, otherwise perfectly healthy, had been noticed to show nystagmus for some weeks. When he first saw the child, Magnus, who approached the baby's cradle from the foot end, could not perceive any symptoms of nystagmus. The eyes followed perfectly any object at her feet, and were turned equally well to the right and to the left; but as soon as anyone approached the cradle from the head end, attracting the child's attention and thereby inducing it to look upwards, violent vertical nystagmus set in, only, however, within the range of the upper half of the visual field. Concomitant with this nystagmus were violent movements of the upper lids. Both ceased instantly when the child looked straight forwards or downwards, returning immediately when anything induced her to look upwards.

In searching for the cause of this phenomenon, Magnus found that the child's nursery was rather dark, having only one window at the far end, and that during the winter a chandelier was usually burning, at which she liked to look. The table on which the baby had its bath was under the chandelier, and could only be seen by her when she looked upwards. Through frequent and prolonged strain in this position, nystagmus seemed to have been induced. In consequence of this reasoning, Magnus had the child's nursery removed to a room with two large windows and plenty of light, and although for the first few days in the new quarters nystagmus set in as soon as anybody approached the cot from the head end, it gradually disappeared, could hardly be traced after three weeks, and had completely ceased after six weeks, never to return again during the four years which have since elapsed.

K. G.

E. LANDOLT (Paris). An Ophthalmotrope. *Archives d'Ophtalmologie, December*, 1893.

Landolt has devised a new instrument, very neat and simple, by means of which one may study and demonstrate the direction of movement of the globe brought about under the influence of each of its muscles.

A schematic skeleton eye, represented by a "cornea," horizontal and vertical meridians, and equator, is suspended by the extremities of the axes of rotation of its muscles in two fixed rings, of which one is vertical and the other horizontal. The side of the eye (right or left), as well as the names of the (axes of) different pairs of muscles, is inscribed on the supporting rings, and for convenience the respective axes are variously coloured. The whole instrument is of a size convenient for manipulation, and by inversion can be utilised to represent either one or other eye.

To represent the actions of the internal and external recti, the "eye" can be rotated about a vertical axis. The axes of the other recti, and of the two obliques, are indicated by small projections, which can be fitted into slots fixed on the horizontal ring, and thus the eye retained in the desired position. The ophthalmotrope shows not only the direction, but the degree of movement in each of the three movements of vertical (raising and depressing) and lateral rotation (ab- and ad-duction), and rotation round an antero-posterior axis (inclination of meridians) accomplished by each of these muscles, so puzzling to the student. It shows, for example, that with equal degrees of rotation the inferior rectus lowers the cornea distinctly more than the superior oblique, but that on the other hand, both the rotation of the vertical meridian and the lateral movement are much more marked in the case of the oblique than in that of the rectus and, of course, these two last-mentioned movements are in opposed directions in the two muscles.

Another application of the instrument is indicated as follows:—Looking from behind one sees, painted in red, on the posterior surface of the "cornea," the vertical meridian. While, then, the "eye," seen from the front, shows the physiological action of any muscle, this red line, seen from behind, shows the position of the false image when paralysis of the muscle in question is present. One muscle being paralysed, the eye adopts a position deviating from the normal, in a direction exactly *opposite* to that which the paralysed muscle would have imposed upon it; and the false image, being deviated exactly *in the direction* of action of the paralysed muscle, corresponds to its physiological action. To take an example: the superior oblique turns the eye downwards and outwards, and inclines the upper end of the vertical meridian of the cornea inwards (towards the nose). Obviously, when the muscle is paralysed, the eye stands too high, too much adducted, and the upper part of the cornea towards the temple; while the false image is inferior, temporal (hononymous), and inclined towards the healthy side. All we have to do is to place the "eye" in the position which the contracting superior oblique tends to cause it to occupy, and to observe from behind, the vertical meridian of the "cornea." This will be found to be depressed, abducted, and rotated, so that its upper end approaches the nose. Thus the red mark on posterior aspect of the cornea indicates the position, &c., of the false image, and also the "corrective" position of the head, for the head is held in such a manner as best to supplement the feeble action of the weakened muscle.

The author points out a method by which it is possible to display even more simply the actions of the ocular muscles. We take a simple india-rubber ball, and paint on it a cornea, the vertical and the horizontal meridians. On this last we mark, at 39° from the anterior pole (summit of the cornea) the anterior extremity of the axis of the two oblique muscles, and at 63° on the opposite side mark the axis of the recti, superior and inferior. It is desired to indicate the action of—let us say—the superior oblique. This muscle causes every point of the cornea to describe a portion of a circle about its (the muscle's) own axis. If, then, we take a pair of compasses, and fix one limb at the anterior extremity of the axis of the muscle, as indicated above, and with the other describe a circle passing through the summit of the cornea, this circle will represent the path pursued by the cornea under the influence of the superior oblique. If we wish to know at what point the summit of the cornea will find itself after a movement through 40°, for example, we have only to trace a line, forming at the centre of our circle an angle of 40° with the horizontal axis —below, if for the superior oblique, above, if for the inferior. The required spot is the point at which this radius meets the circle. And since this radius is simply the line of the horizontal meridian when the eye adopts its new position, the tangent at that point will show us the inclination of the vertical meridian of the cornea. The amount of depression is gauged by the length of the line, perpendicular to the normal horizontal meridian, which also meets the circle at the spot indicating the new position of the summit of the cornea, while the perpendicular drawn from the same point to the normal vertical meridian, indicates the amount of adduction or of abduction, as the case may be.

A simple method of demonstrating the actions of the muscles, such as this, while not absolutely correct in all points, will no doubt prove very serviceable to those whose duties include much teaching of students.

W. G. Sym.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Thursday, March 8, 1894.

D. Argyll Robertson, M.D., F.R.S.E., President, in the Chair.

Orbital Tumours.—Mr. Hill Griffith described some cases of orbital growth, showing photographs and preparations. The first represented the successful removal from the upper part of the orbit—the patient was a man, aged 35—of an encapsuled adeno-sarcoma which was causing downward displacement of the eye. The second was the removal of what afterwards proved to be a hypertrophied lacrymal gland from the orbit of a young girl. When seen six years later a large irregular exostosis (?) filled up the space between the frontal arch and the eyeball. Probably the lacrymal gland had been pushed out of position by the slowly growing mass, and had been mistaken for the actual disease. The third was a symmetrical tumour in a similar position in an otherwise healthy young man, which was regarded as an acute hypertrophic inflammation of the lacrymal glands. The fourth was one of very slow and painless protrusion of the eyeball in an otherwise healthy young woman, in whom a portion of growth could be felt in the upper and outer part of the orbit. Seventeen months after the first visit the tumour was removed together with the orbital contents, the nature of the growth being doubtful. The last two cases were malignant growths in which the orbital contents were removed, death occurring in one case twelve months later from extension of what proved to be sarcoma, and in the other from meningitis on the twenty-fourth day after operation. The author stated that in all such cases he had found pressure sufficient for the arrest of hæmorrhage, and warned others against the use of the actual cautery with this object.

Mr. McHardy questioned the value of the horseshoe incision in these cases, involving, as it did, so much more stitching.

Mr. Juler stated that he had exhibited a similar case, in which a portion of the growth had been removed and subjected to microscopic examination, the opinion being expressed that it was sarcoma. A suspicion of syphilis, however, was aroused, and the patient recovered completely under mercury.

Mr. Adams Frost mentioned a similar case.

The President described a case of symmetrical orbital tumours, both of which had been removed at different times and places, but recurred and finally disappeared under iodide of potassium.

Dr. Little mentioned a case similar to the foregoing in a gentleman, aged 55. The tumours had existed two months, and on removal looked like sarcoma.

Mr. Hill Griffith, in reply, said the horseshoe incision was only adopted in order to give more room where the tumour was very extensive.

School Ophthalmia.—In resuming the adjourned discussion on school ophthalmia, Mr. Hutchinson said that in his paper, so far from exaggerating the frequency and severity of the attacks, he had rather understated them. At the school with which he was mainly concerned, many of the cases had fulfilled the exact tests of workhouse ophthalmia, having frequently relapsed, and lasted six to eight months, developing a most definite condition of granular lids. He thought that there was no initial difference between the epidemic of which he was now speaking and what had been long known as workhouse ophthalmia, except that, the cases being treated without delay, the severer after-consequences were less frequent. With regard to the suggestion put forward by Mr. Nettleship and supported by Dr. Stevenson, that there were two forms of the disease, of which one had severe consequences and the other not, the *onus probandi* rested with them. He himself could find no means of distinction. Inquiries among the public schools had failed to elicit any evidence of previous epidemics. An important question was whether the infection was conveyed directly from eye to eye, or whether it resided in the walls and hangings of the rooms; he was himself inclined to the former view. With regard to the question of certificates, it was extremely difficult to say when the disease was actually present in the early stage, or when it was quite cured. He was not disposed to throw any great responsibility on practitioners in this matter.

The President pointed out that the points on which the opinions of members of the Society were desired were: (1) as to the increase of the disease; (2) whether there was more than one form; (3) the mode of conveying contagion; and (4) the necessity for certificates.

Mr. Juler said that there had been a widespread increase of ophthalmia in the past year, probably owing to the long, hot, and dry summer. He demurred to associating this disease too closely with granular lids, since the majority of the cases did not so develop; and he mentioned an instance in which he had seen 100 boys on one occasion suffering from purulent ophthalmia, of whom the majority recovered under appropriate treatment in three weeks, but thirty subsequently had granular ophthalmia. This might have been present in a mild degree before the purulent ophthalmia was superposed.

Mr. Doyne said that during last autumn there had been an epidemic of eye trouble all over the Oxford district. The ophthalmia was usually cured in a week, and left no sequelæ. He thought follicular conjunctivitis meant very little, but eyes so affected might suffer more from a mucopurulent ophthalmia than such as were quite smooth. Among notes of 12,000 cases he hah only twenty-one of trachoma, of which eleven had been imported. In seven of the twenty-one only one eye was affected, and one had been for a year in a workhouse school without any extension of the disease to others.

Mr. Johnson Taylor (Norwich) stated that during 1893 he had seen no cases of trachoma, but that since the beginning of the present year six cases had come under his notice.

Mr. Nelson (Belfast) mentioned cases which had come under his care with enlarged follicles and asthenopia following measles, and continuing for two years. He suggested the possible conveyance of trachoma from one case to another by the brush in painting lids.

Mr. Critchett agreed that there was evidence of increase of ophthalmia in the autumn of 1893, and of a more severe form than usual, but the cases did not relapse, and he had not seen granular lids resulting from it.

Mr. Priestley Smith said there was a large number of lids with enlarged follicles which might only represent the tendency to adenoid development so often met with in the pharynx in children, especially in those who live in towns. Such enlargement was often excited by atropine, but there was no evidence of its contagiousness. These children might be more liable to conjunctivitis, of which more cases had occurred of late in six months than in the previous six years. He did not connect this with trachoma, which, according to the recent German theory, was the result of a specific germ infection allied to gonorrhœal ophthalmia. The present epidemic, he thought, was due rather to bad hygiene than contagion, which produced this follicular enlargement associated with more widespread purulent ophthalmia.

Mr. McHardy enumerated three forms of granule met with in the lids—follicular, trachomatous, and papillary. He recommended separating the different classes of cases and improving the hygienic conditions.

Dr. Little said that among the cases which had come to him from the public schools he had not noticed any increase in trachoma. He often met with follicular enlargement with irritation, which he thought was made worse by the application of caustic. It was better treated by hygienic measures.

Mr. Stevenson did not accept two epidemic forms of follicular conjunctivitis. Among the cases he had examined 94 per cent. exhibited follicular enlargement, and only a half per cent. trachoma. In the public schools muco-purulent ophthalmia commonly occurred in the spring and autumn.

Mr. Nettleship disclaimed any belief in two forms of school ophthalmia. The tendency to development of adenoid tissue varied with conditions of life, being greater in children, town dwellers and certain races; it was also favoured by defective sanitary conditions. Should an outbreak of conjunctivitis occur among such subjects, a considerable proportion might be expected to develop a granular condition of lids, and then too many precautions could not be taken. Certificates should be given by the school doctor.

Mr. Hutchinson, in reply, said the severity of the outbreak in the school with which he was concerned was attested by the fact that all the boys had been sent home for two months, and that the affected ones had returned in a worse condition than that in which they had left; also that the outbreak had lasted eight months before he was called in. He thought it was of the greatest moment to appreciate the significance of these cases in the early stage, when they were curable, as it was through neglect that the severe and incurable forms of granular lids arose. He did not accept the theory of the gonorrhœal origin of trachoma, and thought it had nothing to do with workhouse ophthalmia. It was an open question whether there was both an ordinary and a specific form of catarrhal ophthalmia. Practically it was advisable to separate the affected boys from the healthy, placing the severe cases under rigorous treatment.

Cases and Specimens.—Cases and card specimens were shown by Messrs. Spencer Watson, J. B. Lawford, H. Work Dodd, Juler, Cowell, John Griffin, Priestley Smith, Adams Frost, and Rockliffe.

LOCALISED POSTERIOR STAPHYLOMATA, WITH DISTORTION OF THE RETINAL VESSELS.

BY RAYNER D. BATTEN, M.D., B.S.LOND.

ASSISTANT SURGEON, WESTERN OPHTHALMIC HOSPITAL.

THE stretching and straightening of the retinal vessels is a recognised accompaniment of the yielding of the eye in myopia. Also the distortion of the vessels to the temporal side of the O. D., and their exit from the disc in numerous branches, instead of in two main trunks, have frequently been described. But it is not usually recognised that the distortion of the vessels indicates the position of the staphyloma. (I wish to limit the term " staphyloma " to its strict meaning, viz., a bulging of the sclerotic—not to confound it, as is frequently done, with the ordinary myopic crescent.) The commonest position for the staphyloma is in the macular region, and this accounts for the common distortion of the retinal vessels in that direction, the retina and its vessels being drawn into the bulge. But staphylomata are by no means limited to this spot, but may occur at any other portion of the fundus, either above or below the O. D., or, more frequently, to the nasal side, and when such staphylomata occur, the retinal vessels are distorted in the direction of the staphyloma.

The diagnosis of these localised staphylomata is, I think, of considerable importance, in aiding us to diagnose the type of myopia under treatment, and enabling us in some cases to adopt early treatment to check in-

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cipient myopia. Their recognition is also of importance in accounting for an otherwise unexplained lack of visual acuity; and in estimating a refraction by retinoscopy, unless they be recognised, they lead to the most variable and faulty results. Their presence shows an apparently physiological myopia to be in reality pathological.

Diagnosis of Staphylomata.—On examination of the fundus in cases of staphylomata, the vessels will be found to be distorted to one side or the other of the O. D. This distortion appears more marked with the indirect than with the direct examination. Following the direction in which the vessels point, a patch of thin choroid, at variable distances from the O. D., is generally found. If now ophthalmoscopic measurements of the different portions of the fundus be made, an increasing degree of myopia will be found as the staphyloma is approached. And if further confirmation of the presence of the staphyloma be required, it may be obtained by estimating by means of retinoscopy the refraction of the different portions of the fundus. I do not think this method of examination is sufficiently appreciated. As a rough test of the presence of staphylomata, it is easily and rapidly applied, and yields approximately accurate results, allowance, of course, being made for the oblique position of the lens. Thus, having ascertained the refraction of the central portion, if the eyes are turned in various directions, the increase or decrease of the glass required to correct is readily obtained

Localised staphylomata, as I have before said, may occur at any part of the fundus. They are commonest in the central region, that is, at or about the macula; but they also occur (2) in the temporal region beyond the macula; (3) in the fundus to the nasal side of the O. D., and at varying distances from it; (4) below the

O. D., where they are generally congenital and associated with so-called Fuchs' coloboma of the O. D.; and

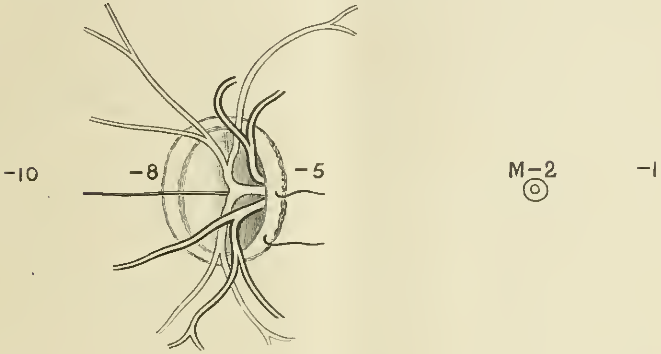

FIG. 1.

Sketch of the arrangement of the vessels in a case of nasal staphyloma. Left eye: direct examination. M = the macula. The numbers are the degrees of myopia at the different portions of the fundus as estimated by the ophthalmoscope. The condition of the O. D. is not quite accurate, having been slightly altered in the woodcutting.

(5) rarest of all, above the O. D. Lastly, some of the forms of central cupping of the O. D. should, I think, be classified with the staphylomata.

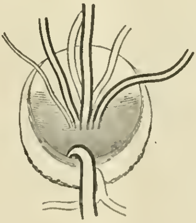

FIG. 2.

Sketch of the condition of the vessels in a case of staphyloma above the O. D.

I propose to describe in some detail the nasal form of staphylomata, which I hold to be of considerable, though unrecognised, importance; not as merely pathological curiosities, but because they indicate a pathological form of myopia, and cause considerable diminution of visual acuity.

In well-marked cases of this condition, the O. D. appears tilted to the nasal side.

The margins of the O. D. are often somewhat hazy.

The central dimple also points towards the nasal side, and the retinal vessels, as they emerge from it, tend in the same direction.

The nasal branches of the retinal vessels, instead of ascending, run horizontally to the nasal fundus, while the temporal branches run towards the nasal side, to, or a little beyond, the margin of the O. D., and then turn back sharply, to be distributed to the temporal fundus. There are generally more numerous small branches on the nasal than on the temporal side of the O. D.—the reverse of what is seen in the ordinary form, *i.e.*, with *temporal* staphylomata (fig. 1).

In some portions of the nasal fundus the choroid will be found to be distinctly thinned, the choroidal vessels visible, with some disturbance of the choroidal pigment.

On measuring with the ophthalmoscope, the myopia at the macula will be found to be less, by one or two dioptres, than at the temporal side of the O. D., and similarly less there than at the nasal fundus.

Localised staphylomata produce far greater effect on the acuity of the vision than the general yielding of the sclerotic in common myopia. Full vision is often not obtainable in these cases, even in quite low degrees of myopia. A staphyloma at the macula, however, interferes with the visual acuity less than those at a little distance from it. Staphylomata to the nasal side of the O. D. interfere with the visual acuity to a considerable degree, so much so that distortion of the retinal vessels, even without marked staphyloma, is sufficient to reduce the corrected vision to $\frac{6}{9}$ or $\frac{6}{12}$. With well-marked nasal staphyloma, the vision is often not improvable above $\frac{6}{18}$.

Staphylomata above or below the O. D. also interfere with the visual acuity, though in a less degree than the nasal staphylomata.

That a staphyloma at the macula should interfere less with the visual acuity than one at a distance from it appears anomalous, especially when it is remembered that the change in the sclerotic and choroid is greatest at the staphyloma. The explanation is to be found, I think, in the loose attachment of the retina to the choroid, allowing it to shift into the staphyloma without becoming stretched. Hence, when the staphyloma occurs at the macula, the disturbance of the retina is less than when it occurs at a distance from it, for then the retina becomes dragged away from the macula, and into the staphyloma—in other words, the dragging on the retina at the macula is greater when the staphyloma is at a distance from, than when it is situated *at*, the macula.

Localised staphylomata are almost always associated with a marked degree of astigmatism.

Staphylomata of the extreme periphery do not appear to affect the visual acuity.

Pathologically, the degree of myopia should be the measure of the greatest depth of the staphyloma, and not the refraction at the macula. If the staphyloma happens to be at the macula, the pathological and the refractive myopia correspond. But if the staphyloma is elsewhere, there may be only a very low degree of myopia, or even emmetropia, at the macula; whereas there may be several dioptres of myopia at the staphyloma.

LOCAL OCULAR THERAPEUTICS BY SUBCONJUNCTIVAL INJECTIONS OF SUBLIMATE.[1]

BY DR. A. DARIER, PARIS, TRANSLATED BY DR. M. BARCLAY, EDINBURGH.

TREATMENT of ocular disease by local therapeutics, a practice which we have adopted for several years, is not based merely on empiricism. It is in accordance with very important anatomical and physiological laws, as shown in our communications[2] to the Ophthalmological Society of Paris, 1891 and 1892. This method takes now a prominent place, not only in ophthalmology, but in all branches of medicine. Whenever it is possible to reach the morbid focus the surgeon comes forward and claims a great number of cases formerly considered to be within the domain of the physician. Even affections depending on general illnesses, such as syphilis, tuberculosis, rheumatism, have, besides their general manifestations, local indications of primary importance.

If the morbid manifestations appear in different organs at the same time general treatment is first suggested. If, on the contrary, they are confined to one place local applications are rendered necessary. This law, above all, applies to ocular troubles which often appear unconnected with other disease, and which our routine attaches to a general diathesis, more or less problematic, because we do not know its true pathology. The idea which has always guided me in my researches is the following:—If an infection, primary or secondary, localises itself in an organ such as the eye, it is of the first importance to extinguish on the spot, if possible, the infectious process, without at the same time losing sight of general indications. When this is feasible surgically, *e.g.*, by the cautery, the aim is easily attained, but if the lesions are not superficial, and tissues are attacked which involve serious danger, what local means have we left? The antiseptic should be injected into the infected focus itself, or into the surrounding parts, in such a manner as to irrigate and to render aseptic all the lymphatic region within which the morbid process has settled; such it appears to me should be the aim of therapeutics in all well localised infectious diseases.

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[1] Compare with Review of Paper, by B. R. Gepner, jun., on same subject in OPHTHALMIC REVIEW, vol. xiii., p. 96.

[2] *Bulletin et Mémoires de la Société Française d'ophtalmologie*, 1891; *Bulletin de la Société d'Ophtalmologie de Paris*, 1892.

The eye is well adapted by the arrangement of its lymphatic system for the application of local therapeutics. Physiological experiments of the highest importance have shown that coloured substances injected under the conjunctiva rapidly penetrate into the aqueous humour, are absorbed and colour the cornea, the lens and vitreous body, as well as the deep membranes of the eye.

Is it not then logical to conclude that the surest means of getting soluble medical substances to penetrate into the interior of the eye is to inject them under the conjunctiva or into Tenon's space? Our personal experience has proved to us that it is a matter of indifference whether the injection be made into Tenon's space or merely under the conjunctiva. The substance penetrates with the same rapidity. Why should this not be so, when a simple instillation of atropine into the conjunctival *cul-de-sac* is rapidly absorbed, and found in the fluid of the anterior chamber a few minutes later? This is a well known fact.

Local therapeutics are indicated in cases where one must act with speed and intensity. We cannot find a better example than sympathetic ophthalmitis, for which the only treatment advocated, until recently, was enucleation and the administration of mercury to saturation. If general mecurial treatment is efficacious, its local application should be more so, and this fact is already recognised and proved by numerous observations reported by others as well as myself.

In secondary, late traumatic, or post-operative infection, finding its way through vicious cicatrices, subconjunctival injections of sublimate have given us results which we could never have obtained with the same rapidity by the old treatment. The most common form of infection is the infecting ulcer of the cornea. In the numerous cases observed by us, we have found that subconjunctival injections of sublimate repeated for several days round the cornea, produce the surest and most efficacious antisepsis. This is not only my experience, but Secondi,[1] Dufour,[2] and Van Moll,[3] have obtained by the same means, excellent results.

With the galvano-cautery and sub-conjunctival injections, any infecting ulcer of the cornea, taken in time, may be promptly cured; which is more than could be said of the old treatment. What I have asserted with regard to late traumatic infection is still truer as regards septic wounds of the eye, where ocular inflammation is imminent. If the suppuration has not yet reached the deeper parts of the eye, sub-conjunctival injections practised freely and repeatedly often save enucleation. If we consider the diseases of the deep-seated membranes of the eye, irido-choroiditis, retinitis, neuritis, &c., we shall be surprised to see that even in these affections of which the etiology is often obscure and in which syphilis, rheumatism and all the other diatheses play such an important *rôle*, these injections have, in many cases, given results which one can have no hesitation in describing as astonishing.

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[1] *Giornale della R. Accademia di medicina di Torino*, 1889.

[2] *Bulletin de la Société Française d'Ophtalmologie*, 1892.

[3] *Klinische Monatsblätter f. Augenheilkunde*, 1892.

We were happy to hear at the last Congress of Ophthalmology, Dr. Pflueger, of Bern, confirm our results by saying that he also had found sub-conjunctival injections most useful, especially in affections of the choroid.

In choroiditis or chorio-retinitis, central, recent, and not too deep, one can study accurately the truly remarkable action of sub-conjunctival injections; the metric scales allow us to record with precision the progressive improvement in acuteness of vision, while the ophthalmoscope shows us exactly how the anatomical lesion develops and resolves.

As regards affections of the optic nerve, anatomical considerations warn us that we cannot hope for complete restitution when a certain number of the fibres have become atrophied. One cannot expect a sure therapeutic action, except in cases where the optic fibres have been only compressed, or momentarily paralysed, in a word, a cure is only to be looked for in those cases where the infectious inflammatory process is of recent date, or when it has terminated without having caused complete atrophy of the optic nerve. Our researches on this subject have been long and troublesome. After a series of successes which we have obtained in certain cases of infectious retrobulbar neuritis, we endeavoured to ascertain what might be done as regards the different atrophies of the optic nerve. In grey spinal atrophy results were *nil.* In white atrophies following old inflammatory processes, we have often succeeded in slightly improving the vision.

With reference to diseases of the iris and ciliary body, we have already seen that in *traumatic affections*, characterised by iritis, irido-cyclitis, or even irido-choroiditis, the effects obtained by local therapeutics were better than those obtained by general ones.

We do not dare to say the same of all endogenous affections, arising from a diathesis, or from a general infectious illness, such as syphilis, tuberculosis, rheumatism, &c., or from a metastatic infection, such as blenorrhœa, &c. Our studies on this delicate point are far from being finished, but we can already state that in many of these affections, sub-conjunctival injections of sublimate, if they do not in themselves constitute a complete treatment, are often a most valuable auxiliary to general therapeutics.

In the various manifestations of syphilis on the iris and ciliary body, one may expect much from sub-conjunctival injections of sublimate. Many cases of *gummatous iritis* which we have treated in this way have rapidly got well. We have even cured cases of irido-choroiditis which have resisted long treatment; but in acute syphilitic iritis it must be admitted that general treatment is first called for. We believe that it is the same for all acute inflammatory processes of the iris and ciliary circle whatever be their etiology, syphilitic, rheumatic or otherwise. A prolonged clinical observation of facts of this kind, contradicting our first ideas, has led us to the conclusion that sub-conjunctival injections are counter-indicated, momentarily at least, every time a circulatory stasis renders the absorption of the medicine difficult or impossible by the obstructed lymphatic passages. The sublimate injected under the conjunctiva will then play the part of a more troublesome than useful irritant, causing acute pain and an intense chemosis.

This important counter-indication once rendered clear, we can state that by following with care clinical indications, and choosing the opportune moment, it is possible to avoid all these vexations, and obtain very favourable results.

Nicati (Marseilles). Note on a New Operation for Glaucoma. *Revue Générale d'Ophtalmologie, Jan.*, 1894.

The January (1894) number of the Ophthalmic Review[1] contained a reference to a new treatment of glaucoma, brought forward by M. Knies (Freiburg) at the Congress of the Ophthalmological Society of Heidelberg, held in August, 1893. M. Knies called the operation he proposed irido-sclerotomy—division of the base of the iris with the knife in making the corneo-scleral incision.

This proceeding, which suggested itself to M. Knies in a case of glaucoma in which, from bulging of the iris, an ordinary sclerotomy was found to be impossible, had for some years been regularly practised by M. Nicati, of Marseilles, and had already formed the subject of many communications from him to French scientific societies.

In the Proceedings of the Académie des Sciences, Paris, of April 23, 1889, and in the *Archives d'Ophtalmologie*, No. 6, 1890, and No. 1 and 2, 1891, will be found the researches of M. Nicati on the glands of the aqueous humour.[2]

As a corollary to these investigations, in 1891 he described an operation for glaucoma, which is published in the Proceedings of the Société de Biologie of July 4 of that year, under the title "Chirurgie nouvelle dans les annexes de la glande des proces ciliaires = ponction-drainage de la chambre posterieure appliquée au glaucome." A further communication from him on the same subject will be found in the Proceedings of the Association Française pour l'avancement des Sciences, Congres de Marseille, Sept., 1891, where the operation is termed "sclero-iritomy," the title of the article being "Traitement du Glaucome par le drainage de la chambre posterieure, ou Sclero-iritomie." "The operation," says M. Nicati in that article, "which consists in dividing the iris at its line of insertion in the sclerotic, has for its object to place the posterior chamber in direct communication with the meshes of the sub-conjunctival areolar tissue, and, at the same time, to modify the secretion of the aqueous humour by dividing the nerves of the iris." ("Also," he adds to-day, to "diminish the reflex contractions of the tensor muscle of the eye—the choroid") —to which his latest researches lead him to attribute an important part in the production and regulation of the ocular tension.

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[1] Vol. xiii., p. 24.

[2] See Ophthalmic Review, vol. x., pp. 106 and 172.

"The puncture, which is made just outside the cornea, penetrates the iris to enter the posterior chamber where the lens is avoided by means of a carefully calculated procedure. The knife, a *lancette à arrêt*, is passed under a fold of the conjunctiva in such a manner as to ensure a valvular opening at a tangent to the cornea and perpendicularly to the plane of the iris."

A similar communication from him was presented at a meeting of the Academy of Medicine, Paris, on February 16, 1892. (See *Bulletin de l'Académie de Medicine*, 1892.)

After an experience of thirty-six cases in which the operation was performed, M. Nicati published the results of his observations in a paper entitled "Scleriritomy and its Indications" (see *Bulletins et Memoires de la Société Française d'Ophtalmologie*, May 4, 1892). A further series of twenty-one cases enabled him to sum up the results of his observations—fifty-seven in all—in the *Annales d'Oculistique*, of September, 1893, where he pronounces judgment on this, his primitive operation as he calls it, in contradistinction to the new scleriritomy as practised by him at present. He says: (1) "The results are remarkably favourable in the treatment of staphyloma following necrosis of the cornea, and especially as a preventive measure against this affection. (2) The result is mediocre in ordinary glaucoma, on account of the tendency to hyphæma, and because the incision, being perpendicular to the coverings of the eye, the edges of the wound are not separated by alternations of pressure, as they are in an oblique wound formed in an ordinary sclerotomy. The incision tends, consequently, to heal quickly without leaving any curative fistula."

So far as his experience then extended, he considered the perpendicular scleriritomy worthy of a trial in certain secondary glaucomas, but not in the essential form of the malady. The operation which he performs to-day is a further development of his original sclero-irotomy. It is based on the principle of establishing a communication between the posterior chamber and the subconjunctival areolar tissue by means of an incision that will not heal readily, and will permit of constant drainage, and, at the same time, of modifying the secretion of the aqueous humour and diminishing the reflex contractions of the choroid by section of the iris.

The following is a translation of M. Nicati's last contribution on the subject, published, as stated above, in the *Rev. Générale*, January, 1894 :—

" The operation is performed with a narrow knife, which ought to be freshly sharpened.

" First stage (introduction).—The blade, edge downwards, is introduced through the sclero-cornea into the inferior angle of the anterior chamber, placed parallel to the iris in a horizontal direction, and finally pushed along in such a manner as to pierce the sclerotic a second time, beyond which counter-opening the point should be made to project one centimetre. This corresponds to the first stage of Wecker's sclerotomy.

" Second stage (rotation).—Giving the blade a quarter turn, it is placed perpendicularly to the iris, with which membrane the edge now lies in close contact. By this manœuvre an incision perpendicular to the first is made in the sclerotic, and the aqueous humour escapes.

" Third stage (extraction).—The blade is rapidly withdrawn in the same plane as in the second position. In doing this the iris is divided along its line of attachment to an extent equal to the contact with the edge of the knife. It goes without saying that care should be taken to remove all that is possible of the blood poured into the anterior chamber as a result of the section of the iris. As far as that is concerned, however, the depending portion of the wound favours the spontaneous evacuation of the blood.

This operation fulfils the indication which requires that the scleral wound should gape easily, since not only is the incision not perpendicular to the sclerotic, but by the second step of the operation it is transformed into a genuine V-shaped flap—a form of wound that ensures the flow of the aqueous humour better than any other.

"The operation fulfils also the indication of dividing freely the nerves of the iris, constituting a thorough iridien neurotomy, which is capable of diminishing the secretory impulses reflected from that membrane. It obeys the call for a good glaucomatous operation, such as we have established it to be in the physiological and pathological study of the glands of the aqueous humour."

M. Nicati in the same article thus summarises the indications, as they seem to him, for the various operations he has proposed.

"(1) Equatorial sclerotomy (proceeding communicated to the Société de Chirurgie, Paris, 1881) has in view the rapid establishment of the anterior chamber and the resolution of an œdema of the vitreous persisting in spite of a good operation for glaucoma.

"(2) Sclero-iridien puncture (scleriritomy primitive) remains the preventive and curative operation for cicatricial staphyloma of the cornea and cicatricial glaucoma.

"(3) Iridectomy should be reserved for glaucoma with occlusion of the pupil.

"(4) Finally, scleriritomy (new) becomes the operation of choice for spontaneous glaucoma."

As regards the new scleriritomy, his conclusions are not theoretical assumptions, but are founded on the experience of a certain number of cases which have not yet been published, but which, as it has been the reviewer's good fortune to see them treated in M. Nicati's "clinique," he is permitted to refer to here.

The number of operations performed up to the present is twenty-two. The first dates back six months, and was practised in an acute attack of glaucoma of several days' duration, in which vision was reduced almost to zero (perception of light doubtful and projection *nil*). The result was so far favourable that not only were the symptoms relieved but the sight was restored to its previous condition, which it has since preserved.

The more recent cases, consisting of various glaucomas, essential and secondary, acute and chronic, demonstrate the wide field covered by the operation, and contribute to an accurate appreciation of its effects. Experience teaches that care should be taken to divide the iris thoroughly, and that, in order to carry out this object, the knife should not be too narrow. It is even permissible to ensure the section of the iris by a few backward and forward movements of the knife in its last position just before withdrawal.

The use of the tonomètre, an instrument for measuring the ocular tension, recently constructed by M. Nicati, and shown at a meeting of the Biological Society of Paris, is of the highest value in testing the efficacy of the operation. To affirm the cure of a glaucoma it is not only necessary that the eye should have lost its hardness, but that it should recover the parallelism of tension with its healthy fellow, or, failing the possibility of establishing this, with the blood pressure generally. To recognise this the tonomètre is indispensable.

Charles Monk,
Surgeon-Major, H.M. Indian Medical Service.

A. W. STIRLING. An Enquiry into the Condition of the Vortex Veins of Twenty Eyes enucleated for Primary Glaucoma. *Royal Lond. Oph. Hosp. Reports, xiii., iv.*

The object of the investigation undertaken by the author was, to quote his own words, "to discover whether there existed in the veins of any of the eyes examined a pathological condition which might have any connection with primary glaucoma."

Before referring to the results of the present investigation, it may be well to allude shortly to those obtained by Birnbacher and Czermak, who some years ago[1] undertook a similar enquiry in the case of seven glaucomatous eyes, five of which they called "chronic inflammatory" and two "glaucomatous degeneration." In all these seven cases they found chronic inflammation of the whole uveal tract, as well as inflammatory and atrophic changes in the choroid, the former, which were chiefly in the equatorial region, originating in the external layers and only later invading the chorio-capillaris. But the most remarkable abnormality noticed by these observers was the periphlebitis and endophlebitis of the vortex veins, the latter, which was probably a direct result of the former condition, being so pronounced as, in some cases, to cause actual obliteration of the vessel. There was no defect in the vascular endothelium, and therefore, presumably no formation of a thrombus. The authors regarded the changes in the vortex veins as secondary to the choroidal inflammation, and not to the raised intraocular pressure. They concluded that the "glaucomatous eyes examined by them exhibited conditions tending to raise the intraocular pressure in the narrowing of the lumen in the emissaries of the vortex veins, the adhesive inflammation round the venous trunks and the thickening of their walls."

In 1890 Birnbacher published the results of an examination that he had made into the condition of the vortex veins in a case of acute glaucoma which had recently come under his notice. Here, in the middle zone of the choroid the capillaries and branches of the vortex veins showed a predominance of white blood corpuscles, some, indeed, containing nothing else. The lower vortex veins were normal, except that in a few places little bunches of leucocytes were sticking to the inner wall. The upper and inner vein from its entrance into the sclera to the middle third was filled with leucocytes, which were also seen singly and in groups in the lymph space around the vein.

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[1] See *Graefe's Archives*, xxxii., 2 and 4, and OPHTHALMIC REVIEW, vol. vi., p. 169.

In place of the delicate vein wall clothed with regular epithelium, was a compact mass set through with leucocytes which appeared as well upon the choroidal as the scleral side of the lumen. At the beginning the wall was pretty regularly thickened, but later showed swellings in half cylindrical form which ran in the direction of the vessels. The lymph space was filled with thick, poorly nucleated tissue of concentrically arranged bundles of fibres which ran parallel with the vessels. The contents of the vessels were the same only richer in nuclei. No vein wall could be seen. The above swellings were clothed with irregular epithelium. The angle of the anterior chamber was obliterated in one-third of its circumference by adhesions between the iris and cornea, while in the remaining two-thirds although there were no adhesions close up to the angle there were at a little distance from it.

Birnbacher maintains in his comments on this case that the glaucoma could not be due to blocking of the angle of the anterior chamber, inasmuch as the iris, in two-thirds of its circumference, was not in contact with the cornea up to the angle itself. He does not think that the increased tension of the globe resulted so much from the adhesions between cornea and iris, as from the condition of the vortex veins; in fact, that the glaucoma resulted directly from the change in these veins followed by a serous choroiditis. The adhesion he believes to be of later date than the vascular condition, possibly they occurred only during the acute attack.

Turning now to the results obtained by Dr. Stirling in his investigation we find a very different state of matters. He first examined the veins in eleven normal eyes, noting their number—forty-six in all—their relation to muscles (it is worth mentioning that of the forty-six veins only six were found to be underneath muscles, and these were distributed among four eyes[1]), structure, &c. The walls were thin, composed, in fact, merely of endothelium and a basement membrane, and they were surrounded by a lymph space. In eleven of the twenty glaucomatous eyes there were inflammatory choroidal patches, and in only three of the twenty was anything abnormal detected in the venæ vorticosæ.

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[1] With reference to the bearing of this question see paper by Dürr and Schlegtendal in *Graefe's Archives*, xxxv. 2, p. 88, noticed in OPHTHALMIC REVIEW, vol. viii., p. 339.—ED.

The following is the author's own description of the pathological changes in the vortex veins in the three eyes referred to. It should be stated that he uses the word "inflammation" as indicating an exudation of leucocytes, and not as an exudation of mere fluid without cells.

No. 13.—"Shows a slight inflammation round the vein at its choroidal extremity. In this eye, as in some others examined, there were also patches of inflammation in the ciliary body."

No. 14.—"Shows an inflamed patch in the wall and perivascular sheath of a vortex vein in the sclerotic, and the lumen is partially filled by a blood clot composed chiefly of red cells; and in the wall of a vein just external to the sclerotic and close to the vortex vein (so that it might perhaps be a continuation of the latter), is a markedly inflamed patch. Inflamed patches are also found in the choroid and ciliary body."

No. 16.—"Shows patches of inflammation in the vein-wall and perivascular sheath, and in the choroid; then in the lumen of the main vessel, but not in its wall, and not in any of the vessels of the choroid, are circular bodies, taking on strongly the hæmatoxylin nuclear stain. They are about one-fourth the size of a nucleus, give a bright reflex from their centre, and are situated in patches in the red blood-clot which occupies part of the lumen of the vessel. What these bodies are, I am not at present prepared to say. They may, perhaps, be some form of parasite, but are too large for any of the known cocci, and what they may signify, I have been unable to discover."

It will be seen, therefore, that Dr. Stirling's results by no means correspond with those of Birnbacher and Czermak, indeed he entirely fails to find the constant pathological changes in the vortex veins, which in glaucomatous eyes have been described by the other observers. The question is an interesting one, and is worthy of further investigation, even though we may not, considering the now usually accepted pathology of glaucoma, be inclined to allow much weight to a view which directly refers increased ocular tension to change in the vortex veins.

N. M. ML.

W. B. MARPLE (New York). On the Pathology of Hypopyon Keratitis. *Archives of Ophth., xxii. 4.*

The following is the history, given in brief, of a case of hypopyon keratitis, which occurred in a glaucomatous eye, and which is of some interest as it seems to bear on the pathology of the condition and especially on the origin of pus in these cases.

E. S., a woman aged 52, has been blind in the left eye for two years owing to glaucoma. The globe is of stony hardness. Three days before she came for advice the eye had begun to inflame. There is now an infiltrated ulcer about 3 mm. in diameter in the lower and outer quadrant of the cornea, about 2½ mm. from its margin. Ulcer deep and with sharp edges. Anterior chamber nearly half full of pus. Pupil is widely dilated and unaffected by eserine. Pain so intense that enucleation was at once performed. Measurements of globe were 23 mm. in the equatorial diameter and 22½ mm. in the sagittal. The eye was hardened in Müller's fluid and sections cut.

Microscopic examination.—Conjunctiva greatly thickened, especially at the corneal fold. Cornea shows thickening of epithelium at the periphery. Lamellæ in the immediate neighbourhood of the ulcer are densely infiltrated with pus cells, but the infiltration is densest in the anterior layers of the cornea, diminishing towards Descemet's membrane; it also rapidly diminishes towards the centre of the cornea, so that at only $\frac{1}{2}$ mm. distance from the edge of the ulcer there is, in this direction, no trace of any infiltration; towards the adjacent limbus the infiltration extends much farther, especially in the anterior and middle layers. Descemet's membrane is intact throughout; there is no evidence of cells penetrating it. The author calls special attention to the fact that pigment granules have migrated into the peripheral corneal lamellæ just in front of Descemet's membrane. Anterior chamber contains much pus in the lower half mixed with a fibrinous interlacing network. Iris adherent to cornea at the periphery for a considerable distance, and the filtration spaces are obliterated. Iris hyperæmic and much infiltrated, especially in anterior layers. There are numerous pigment granules scattered throughout the exudation. Ciliary body also hyperæmic and infiltrated. The endothelium lining Descemet's membrane at the back of and below the ulcer cannot be distinguished, but above and towards the centre of the cornea it is again apparent.

The conditions here present tally with the view held by Leber as to the nature of these cases. He holds that in hypopyon we seldom, if ever, have to do with a corneal abscess. The fact that Descemet's membrane was intact excludes a corneal origin for the accumulation of pus, and a corneal origin is still farther excluded seeing that the iris angle was completely closed, and the periphery of the iris adherent to Descemet's membrane. This closure of the filtration angle further makes it impossible to believe that the pus could have originated in the vessels adjoining the spaces of Fontana, as apparently was the case in the examples brought forward by Stromeyer and Hoffmann. In the present instance the only possible sources are the iris and ciliary body. What would seem to lend weight to such a view is that there was marked iritis, the anterior layers of the iris being so much infiltrated that it was nearly impossible to distinguish between them and the exudation of the hypopyon. Again, there were numerous pigment granules—obviously derived from the iris—scattered throughout the pus.

The question as to the source of the pus, (1) in the anterior chamber, and (2) in the cornea, in these cases is always one of some interest. With regard to the first, there are supposed to be three possible sources, viz.: (α) the iris; (β) the vessels which are in the immediate neighbourhood of the spaces of Fontana; and (γ) the cornea. We need not refer to the arguments for and against the view that the pus is often derived from the two first of these sources. They have been fully discussed, and in the author's opinion there can be no doubt that in most cases either the iris or the vessels adjacent to Fontana's spaces or both contribute to the pus of the hypopyon. As to the cornea, it is generally accepted that the hypopyon is not formed by pus which reaches the anterior chamber through a fistulous opening in Descemet's membrane. For one thing, all specimens of this disease which have been microscopically examined, have shown a perfectly intact Descemet's membrane, unless of course there had been a previous perforation with escape of aqueous and formation of synechiæ. Again, the anatomical structure of the cornea with its interlacing lamellæ, would alone hinder the gravitation of pus in any quantity except between Descemet's membrane and the cornea proper. Further, bacteriological experiments go to prove that in the early stages of hypopyon, there are almost never any microbes to be found in the pus of the anterior chamber while they are present in abundance, and from the beginning in the corneal ulcer and the neighbouring tissue. In the author's case no microbes were found in the hypopyon, but he admits that his failure to find them does not necessarily imply very much, as the specimen was not prepared with the special view of looking for them. He thinks that the presence of undoubted pigment granules is very suggestive as to the source of the deposit in the anterior chamber.

It is well known that in the early stages of many ulcers of the cornea, a coagulum or circumscribed deposit of fibrin containing pus cells is formed on the posterior surface of the cornea just posterior to the seat of the ulcer. This fact led to experimenting on rabbits with a view to ascertaining, if possible, whence or how the pus came to be present in this exudation, but although much discussion on the subject arose, no very definite conclusions were reached. "But," we quote the author's own words: "the writer feels justified in asserting pretty positively from experiments of his own, that the pus in this exudate does not reach its seat on Descemet's membrane by way of the aqueous. He has produced artificially in the eyes of rabbits inflammatory conditions at the centre of the cornea, and by means of a hypodermic needle has evacuated the aqueous forty-eight hours after the commencement of the process, and at a time when the exudate on Descemet's membrane with pus cells was well marked microscopically. This was then in a small tube put in a rotary centrifugal machine, such as is used for throwing down urinary deposits, blood cells, &c. The fibrin present in the aqueous was all thrown down, but very careful microscopical examination of numerous specimens, failed to reveal the presence of a single leucocyte." With the other question in these cases, viz., the source of the pus in the cornea, we are not at present concerned.

N. M. ML.

R. ULRICH (Strassburg). Glaucoma experimentally produced in Rabbits. *Archives of Ophthal., xxii.*, 4.

The author had previously[1] experimented in this field of research, but a case which came under his observation in May, 1887, determined him to renew his attempts to produce glaucoma in animals, particularly with the idea of converting the normal spongy vascular iris into an atrophic membrane, so as to bring about the greatest possible amount of vascular obliteration.

The case which thus suggested to him the renewal of his investigations, was one of gonorrhœal conjunctivitis, where there had been rapid and complete necrosis of cornea, the iris at the same time becoming adherent to the lens capsule in a state of extreme myosis; the narrow pupil was occluded by exudation. The cornea having been entirely destroyed, the strain of resisting the intraocular pressure was thrown on the iris, which at two points showed bulging, so that incision became necessary. Four weeks later smooth healing occurred, with the iris in its normal position, except that it was intimately adherent to the lens capsule. "According to the retention theory," says the author, "we ought to have had glaucoma; but instead, after observation for five months, the eye showed excellent perception of light, a good field and normal tension. The iris, free and exposed to the air, constantly became more fibrous in character through the growth of white connective tissue in its substance; when this fibrous degeneration had reached a certain point (in December, 1887), glaucoma set in."

Ulrich found it difficult to explain why an eye, with apparently normal secretion, should for a period of five months preserve a healthy state of tension while the contents of the vitreous and posterior chambers were at the same time completely separated from the chief exit in the iris angle. Hence, he set about the attempt to produce, experimentally in rabbits, a similar condition of the eye. At first he excised the cornea *in toto* in two animals, but both experiments failed, one through the onset of panophthalmitis, the other on account of granuloma which developed on a large portion of the iris. In his next attempt he was more fortunate. By removing successive quadrants of the cornea extending into the pupil, and allowing each defect to heal with an adherent iris before proceeding further, he ultimately succeeded in effecting multiple excisions of the cornea in eleven cases, each with more or less extensive adhesion of the iris to the corneal scar. Four of these cases developed well-marked secondary glaucoma, with definite and constant increase in intraocular tension ; in five cases increase of tension was doubtful or inconstant, and in the remaining two, the eyeballs became soft. In the four glaucomatous globes there was a close resemblance, not only in the course of the disease but in the pathological changes developed. From one to three months after the artificial production of leucoma acute increase of tension ensued, accompanied, in some instances, by hæmorrhages into the corneal cicatrix with partial bulging of the latter, while the whole globe seemed to increase in size as compared with the uninjured one. We quote the author's summary of the anatomical conditions which he found in the four eyes, so far as they relate to the production of glaucoma. " In all four cases there were extensive anterior synechiæ, especially of the pupillary portion of the iris. The histological changes of the iris consisted of fibrous sclerosis and atrophy ; the latter had reached such a degree in portions that we could assume that blood-vessels must have become obliterated ; on the other hand, there were areas, especially in the pupillary portion, which showed dilatation of the blood-vessels. The anterior chamber and the spaces of Fontana were more or less contracted or obliterated. Most of the ciliary processes appeared hyperæmic. There were pigmentary deposits, especially in the neighbourhood of the blood-vessels, and there was also pigment in the blood-vessels (pigment-thrombosis). The vitreous was infiltrated with albuminous fluid, especially in one of the cases. Retina, choroid and vasæ vorticosæ negative." The writer draws special attention to two important points observed during life, viz., (1) the early occurrence of hyperæmia of the ciliary processes, and (2) the simultaneous occurrence with this hyperæmia of hypersecretion of the aqueous humour as demonstrated by subcutaneous injection of fluorescin.

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[1] *Graefe's Archives*, xxx., 4, p. 274.

Comparing now these four cases of successfully produced secondary glaucoma with the next four in the series which resulted negatively, it is interesting to note the differences. The latter were observed for from five to ten months—longer than the first four cases—with the expectation that glaucoma might develop. At the end of these periods the animals were killed. Microscopical examination showed incomplete adhesions of iris to cornea, and especially a freedom of the margin of the iris. Hypersecretion of the ciliary processes could be demonstrated, but it did not lead to increase of tension. The differences in the anatomical conditions of the two sets of cases were slight, but it is of importance to note them. Thus, in the second group—that in which glaucoma was not induced—it was noticed that the pupillary portion of the iris was less adherent than in the first ; again, there was less deposit of pigment in the ciliary processes. The pigment infiltration of these processes may be looked on as an important symptom of chronic hyperæmia, showing the existence of a long continued process associated with stagnation ; in the second group of cases no such marked hyperæmia was present. The author sums up the results of his experiments as follows: "The immediate effect of an extensive incarceration of the iris in the corneal defect is, besides the mechanical imprisonment, traction upon the iris and the corresponding part of the ciliary body, and partial narrowing of the anterior chamber and Fontana's spaces. We notice an immediate hyperæmia of the ciliary processes, and an increased production of aqueous humour. The mechanical incarceration of iris tissue acts directly, and the secondary fibrous degeneration and atrophy act indirectly to produce disturbances of the circulation in the iris. My experiments on animals have convinced me that incarceration of the pupillary portion of the iris produces glaucoma more readily than peripheric incarcerations. The reason for this seems to be that the former encloses a larger vascular area than the latter." He looks on the hypersecretion of the aqueous as the fundamental factor in the production of glaucoma, and the results of his present investigation as direct evidence in favour of the secretion as opposed to the retention theory of the disease.

N. M. ML.

W. GOLDZIEHER (Budapesth). A Case of freely movable Fibroma of the Orbit. *Centralblatt für prakt. Augenheilk., March*, 1894.

The following instance of a tumour which, originally springing from the orbit became later subconjunctival, is, the author thinks, worthy of record.

K. H., aged 17, a shopman, came on December 27 to Goldzieher's clinic, on account of a suppurating sty of the left upper eyelid. It needed only a glance, however, to show that a much more important malady lay behind. The left upper eyelid was unduly bulged out and stood clear of the globe. Even when the palpebral fissure was only half open, it was easy to see that a swelling separated the lid from the eye, and with the upper lid raised to its full extent one could then detect a rough irregular tumour which was covered by highly injected conjunctiva, and reached from the outer angle of the fissure to within a few millimetres of the temporal margin of the cornea. The growth was everywhere clearly defined from that part of the globe on which it rested, and upwards, presented a definite edge limiting it towards the orbital margin; it could be followed by the finger for a considerable distance into the orbit, was freely movable and not sensitive to pressure. There was no trace of granular change in the conjunctiva which might possibly have suggested a starting point for the swelling. Both eyes were emmetropic, had full vision, and nothing abnormal could be detected by ophthalmoscopic examination. Diplopia was present only when the patient looked towards the left. General health excellent, there were no swollen glands, and no history of any illness worthy of record. All that the patient could say, was that he had noticed for about two years a small swelling on the white of the eye which had gradually grown larger, but had given him no trouble.

The lad was taken into hospital and the growth removed. The operation presented no special difficulties, and healing took place so rapidly, that in eight days the patient was able to leave without a trace of his former complaint.

Macroscopically, the growth in its fresh state was oval, tolerably hard, about 3 cm. long and 2 cm. thick; before removal about a third of the whole mass had projected beyond the orbit and lay under the conjunctiva. The orbital part showed an even surface as though it were encased in a smooth capsule; the anterior subconjunctival portion was more irregular and nodular; it was also rather softer than the other.

Microscopic examination gave the following result. The greater part of the growth shows thick connective tissue fibres arranged closely together with comparatively few spindle cells interspersed. The fibres, as a rule, run parallel and group themselves round vessels, in whose immediate neighbourhood, it should be mentioned, the tissue is richer in cells than elsewhere. In spite of the solidity of the tumour, there are very numerous vessels throughout its substance. In the orbital portion the fibres which were in close proximity to, and probably pressing on the bone are not so healthy looking, and there are fewer cells. The impression derived from a survey of the sections is that the growth has developed round a number of vessels. In any case the author thinks it is impossible that it can have sprung from any fibrous structure such as the periosteum or Tenon's capsule, seeing how perfectly movable it was throughout. Its origin also from lymphoid tissue, or from the lacrymal gland is excluded, inasmuch as no trace of such structure could anywhere be detected.

Simple fibromata of the orbit, *i.e.*, fibromata which are in no way intermingled with sarcoma, adenoma, or other tumour elements, are exceedingly rare. This case stands alone in the author's personal experience, although he has frequently had orbital growths under his observation, such as adenoma, angioma, osteoma, not to speak of three tumours of the optic nerve. The literature of the subject also bears out the writer's assertion as to the rarity of such orbital fibromata.

A point which is particularly noteworthy in the case above described, is the way in which the swelling, originating, as it undoubtedly has, in the cellular tissue, has shown no tendency, even in its later development, to intermingle with any fibrous sheath; it has grown forward, pushing the conjunctiva before it, but is entirely separate from this membrane. This manner of growth had an important influence on the function of the eye, for had the growth as it got larger become intimately attached to other structures, there must have been considerable dragging on the nerve, with consequent disturbance of function. As it was, the sight of the affected eye was in no way impaired.

N. M. ML.

Bifocal Lenses and Anisometropia.

Our attention has been called to a modification of ordinary spectacles, which has been suggested and carried out by Mr. W. A. Dixey, of New Bond Street, under the name of bifocal lenses. It is, of course, well known that in cases of anisometropia where there is good binocular vision, lenses giving the full refractive correction for each eye are often very uncomfortable to the patient, even if they are tolerated by him. The cause of the discomfort is due, not only to the disturbance of balance between accommodation and convergence, but also to the difference of prismatic effect of the two lenses.

Accepting 8.7 mm. as the distance from the centre at which a lens of 1D. gives a prismatic effect of 1°, we can, by means of the following formula, measure the prismatic effect (P.) of any given lens at any part of it. If d. = the distance from the centre in mm. and D. = the number of dioptres, then $P. = \frac{d. \times D.}{8.7}$ Thus, for example, in a — 6D. sph. lens at a distance of 4.35 mm. from its centre P. = 3°, and of 15 mm. P. = 10°. A — 3D. spherical lens will at the same distance give half this prismatic effect, so that assuming a patient to be fitted with spectacles (R. — 6D. sph., L. — 3D. sph.), there will be a difference of prismatic effect ranging from 0 at the centres of the lenses, to 5° or more at their margins. In other words the patient, when looking through his glasses at a point 5 mm. from their centres, has to correct a displacement such as would be caused by a prism of 1½° held before one eye, and when looking through the lower margin of his lenses, by a prism of 5° base down.

The inventor of the bifocal lenses, who has published a short pamphlet on the subject, adds a table giving the equivalent prismatic effect of several lenses of different strength at varying distances from the centres. He suggests that while ordering for both eyes their full correction it may be well "so to limit the size of one lens that the difference in prismatic effect of the extreme margin of the lens, and of the corresponding part of the other lens, does not exceed what can be corrected without undue effort." He attains this object by working concentrically two lenses on one glass, "the inner one to the right refractive correction of the eye before which it is placed, and the outer one to the right correction of the other eye." The size of the inner lens will depend on the difference between the two lenses, and on the limit of effort by which fusion is easily attained. The inventor thinks that in no case is it advisable to exceed a difference of prismatic effect of 2°, while in many a smaller amount would be necessary.

We cannot speak from personal experience of these glasses, but the idea seems reasonable, and we can imagine that, in not a few cases, lenses ground on this principle might afford considerable relief. N. M. ML.

GALTIER (Nimes). On the Treatment of Infective Ulcers of the Cornea. *Annales d'Oculistique, March,* 1894.

The author draws attention to the treatment of infective corneal ulcers (using the curette, free antiseptic irrigation, and then occlusion), advocated by de Wecker at the Congress of the Société Française d'Ophthalmologie, held last May, and referred to in the *Annales d'Oculistique* of July, of the same year. He describes a case which, as demonstrating the relative value of the different parts of the treatment, is very instructive.

A boy, 14 years old, a druggist's assistant, was burnt in the left eye by a solution of ammonia. The injury was situated chiefly on the lower part of the ocular, and a corresponding portion of palpebral conjunctiva, but the cornea at its inferior edge was slightly dimmed. The eye was immediately bathed with water and boric solution. Galtier did not see it till the following day. At that time it was red and watering, but otherwise looked fairly quiet. Remembering, however, that injuries of this kind often give no indication during the first few days, of their future virulence, he began and continued very active antiseptic treatment; viz., boracic acid, and sublimate solution frequently applied, with boracic acid pads worn in the intervals.

Two or three days later there was a muco-purulent discharge and the lower part of the cornea became infiltrated and ulcerated. Treatment was continued, but in spite of it, both suppuration and ulceration increased. The cautery was now resorted to without avail; then Sæmisch's section, and still there was no arrest of the disease. A few days afterwards the cornea was yellow throughout, and ten days after the complete loss of the cornea suppuration was still profuse. There was now no hope of saving the sight, so Galtier altered his tactics. He washed out the conjunctival sac very thoroughly and then closed the eye for twenty-four hours. The next day the pus was rather less abundant. Another irrigation and antiseptic dressing and the eye was closed this time for two days; suppuration again reduced. A final closure for three days; suppuration ceased.

A short time afterwards, another case of very similar character came under the author's care. Here the left eye was burnt in almost exactly the same place by a squib which the patient had exploded. For the first few days the eye remained quiet, and then ulceration set in. Profiting by his recent experience Galtier curetted the ulcer, used free antiseptic irrigation, and closed the lids for four days. The result was excellent, and the eye healed without a hitch.

Since then the author has treated in the same way eight or ten cases of traumatic ulcers, that have become infected owing to lacrymal disease from which the patients were suffering. In all he obtained very good results, the ulcers healing, he thinks, with less opacity than had usually occurred in similar cases, not treated by this method. He is of opinion that the most important part of the treatment is the persistent closure of the lids; the curette certainly is of use, inasmuch as it removes all *débris*, and allows much more thorough irrigation than would be possible without it, but he has found, in several cases, where he has used both curette and antiseptic irrigation freely, and closed the eyes only for twenty-four hours at a time, that very little progress was made, even over a period of weeks, but that so soon as he tied the eyes up completely for three or four days, rapid improvement followed.

Towards the close of his short paper, Galtier discusses the question whether this method of treatment is equally applicable to ulcers infected by dacryo-cystitis, as to those where there is no such complication. Valude and others think not, but the author does not agree with them. His own experience, as explained above, is in its favour even here, and he goes so far as to believe that the sac affection itself benefits by the prolonged closure of the eye. He suggests, as the probable explanation of the efficacy of occlusion, that by it air is excluded, or, in great part excluded from the infective microbes, and that without air they cannot live. If this be so, it is, of course, not unreasonable to suppose that, after careful washing out of the sac with Anel's syringe—a proceeding which it ought to have been said Galtier in his cases of infective ulceration associated with lacrymal disease, always adopted—benefit would result both to the diseased lacrymal apparatus, and much more to the ulcer. In any case he strongly advocates the treatment in both classes of the disease.

N. M. ML.

NOTES OF A CASE OF TRAUMATIC ENOPHTHALMOS.

(*From the Eye Clinic of Professor Fuchs, in the General Hospital at Vienna.*)

By Alex. Ogilvy, M.D., F.R.C.S.I.

As we have had the opportunity of seeing several cases of enophthalmos lately, Professor Fuchs was anxious that they should be published, hoping, perhaps, that they would clear up a little the present state of ambiguity as to the cause of this phenomenon, or, at any rate, lend their weight to one side or the other of the arguments. And first let me give the notes of a case I had an opportunity of seeing here within the last three months:—

Six months before coming to the hospital the patient was knocked down by an ox, and as he lay on the ground he was trampled on by the animal. Both eyes are destroyed, and it is curious to note that although the violence was applied on both sides of the nose, it has escaped all injury, showing not even the smallest cicatrix.

Present State.—Left eye is dislocated inwards and downwards. A finger can easily pass between the eyeball and roof of the orbit but not behind it, as in one recorded case. The orbit measures 3½ cm. from above down, and 2 cm. across, as against 3 cm. and 2½ cm. respectively on the right side, showing the

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crushing in and lengthening of the cavity in the vertical diameter.

There are three fractures of the edge of the orbit, one above the outer third of the orbital margin, one below at the outer angle. The malar bone, which is roughly the part included between these two fractures, is driven bodily inwards towards the nose, and this crushing in of the outer wall of the orbit one would think would have had the effect of producing an exophthalmos rather than an enophthalmos, but for the fact of a third fracture in the middle of the lower edge of the orbit, just above the infra-orbital canal. It seems likely that the force being applied from without caused a bending of this lower wall, and this being pushed to an extreme degree the bone broke at its weakest point, viz., where the infra-orbital canal runs. Be this as it may, the fracture, which is a V-shaped one, extends down into the canal. The fracture extends also inwards as far as the lacrymal bone, and has evidently implicated the lacrymal sac, which is inflamed and full of pus.

Corresponding to this fracture is a cicatrix in the lower lid, extending right through the lid up to the edge, and from the conjunctival surface of this is a tag of symblepharon, which is attached to a wound in the cornea, to be mentioned later, and which, although evidently a little lengthened out by the movements of the eyeball, still, undoubtedly, very much hinders those movements.

The palpebral fissure presents a sinuous curve, the long diameter being 23 mm., while the vertical diameter is 5 mm. When the patient makes a great effort he can widen this to 8 mm. The left lower lid is 4 mm. lower than the right when the face is still; left eye is 4 mm. lower than the right, and is 3 mm. deeper in the orbit. I may say that the right eye is shrunken, so that the deeper position of the left is all the more remarkable. The movements of the eye are very limited. To begin with, there is an internal strabismus of 20 degrees, the eye being held in this position by the tag of symblepharon above mentioned. The extent of motion up and down is only 1 mm., outwards 2 mm., and inwards 5 mm., and this last always loosens the tag of symblepharon.

On the eye itself one observes that the cornea is 2 mm. in the horizontal diameter, and 8 mm. in the vertical; a large scar runs across the lower part, which is evidently an old rupture, and through which the lens and entire iris (which are wanting) have escaped; it is to this cicatrix that the symblepharon is attached. This wound differs from the usual rupture of the eyeball, the general situation being not in the corneal tissue proper, but above, just outside the limbus, indeed quite in the sclera. In the centre of the cornea is a large macula with vessels running to it from the limbus; with the ophthalmoscope one may observe that the upper part of the cornea is fairly transparent, allowing the red reflex to be seen, that several bands of lymph run into the back of this macula from the ciliary body, and on one of these is a hæmorrhage; also there is detachment of the retina above, but as to its exact limits it is impossible to say; the disc cannot be seen. There is absolutely no perception of light. Unfortunately for our comparative observation, the right eye has also been injured and is in an atrophied condition, the vision being barely perception of light, with no projection; but still, although the eye is shrunken, it is easy to see the difference between an already shrunken eye and an enophthalmic one, as the left undoubtedly is.

As far as one can judge from the reported cases there is too great a tendency to dogmatise as to the cause of this disease. Most of the authors have seen, or at any rate have written about, only one case, and from this they are apt to draw a conclusion as to the cause of all the other cases. In Schapringer's patient it was clearly a temporary paresis, and must have been muscular, and we have only Müller's muscle innervated by the sympathetic to look to for an explanation, for no one seems to have agreed with Himly in the first reported case, when he suggests that the superior oblique has most to do with enophthalmos. In my own case, I am of opinion that it is caused by the fractures of the orbital bones allowing the eye to sink downwards and backwards, but whether there is any absorption of the pad of fat I have not any means of ascertaining.

In giving a *resumé* of the reported cases as follows I must acknowledge my indebtedness to Dr. Theodore Beer, who made the notes of the first case observed in this clinic.

The following have already been reported :—

(1) *Himly* (*Krankheiten und Misbildungen des Menschlichen Auges*, 1843, part 1, page 395) says he saw a case in which a very marked degree of enophthalmos followed suddenly after a blow in the orbital region ; the eyelids were always closed and the arched appearance was lost, so that it appeared as if no eye lay behind them. When they were opened the eye was seen to be of normal size and with normal movements ; he thinks this was caused by the trochlea being broken off and so the superior oblique was not able to hold the eye forwards.

(2) *Nieden* (*Klinische Monatsblätter für Augenheilkunde*, xix., Jahrgang, page 72) saw a case in the right eye of a workman who, when in a trench, had a large mass of earth fall on him. He was struck down and the earth rested on the right side of his face and body, in which position he lay senseless for two hours and a half; when he was dug out no wound could be seen. After eight days he had quite recovered, and the right side of his face had resumed its normal colour and shape ; after fourteen days he noticed there was something wrong with his right eye, but its functions were unimpaired. Nieden says when he first saw the patient he looked as if he had an artificial eye, as his lids were sunken back (zurückgesunken). The lids,

especially above, were marked by a sharp line corresponding to the edges of the orbit, the movements of the lids were normal, the eye was freely movable in all directions, but was sunken 4 mm. in the orbit. Vision was normal and binocular vision not disturbed. The author thinks this sinking back was caused by the shrinking of the fatty tissue of the orbit from the long continued pressure.

Talko (*Klinische Monatsblätter fur Augenheilk.*, xix., Jahrgang, page 471) saw a case in a soldier 25 years old who, while cutting wood, was struck by a flying piece. Vision at once began to decrease, and he had pain in the eye. Seven months after the accident it was observed that on right side the lids lay as if over an atrophied eye, the palpebral fissure was diminished. When the lids opened the eyes spasmodically rolled up: pupil and fund. normal. Vision of right eye was lost, and with left was reduced to counting fingers. At first he had a pulsating pain in the region of the orbit, temples and ears at night. After this the pains increased, and patient said he felt as if the eyes were being drawn backwards; a month later there was total blindness, the pains still persisting; the conjunctiva was strongly injected, the retinal veins increased in size, the eye was so deeply sunken that the difference between the ant. pole of cornea and edges of orbit was six lines, the left being four and a half lines. The author assumes that this was caused by the disturbance of the trophic vaso-motor nerves, which seemed to account for the sinking of the eye, the disappearance of the fatty tissue, the congestion of the eye, the ptosis and the pathological condition of the cornea which set in afterwards.

Gessner ("Enophthalmos traum." *Archiv. für Augenheilk*, vol. xviii., page 297) saw three cases of traum. enoph.; the first was in a miner who was thrown down by a falling mass of coal, and whose face struck against a stone so that he became senseless: patient had a fracture of his lower jaw and malar bone, and besides this a wound at the upper margin of orbit on the same side. After ten days the swelling was so far reduced that he could open his right eye, when both he and his friends observed that the right eye was smaller than the left. The state at the time was as follows. On the right supra-orbital margin there was a cicatrix from the supra-orbital notch to the outer canthus; on the eyelids themselves there was a circumbulbar depression. The distance between the outer and inner canthus was 2 mm. less than on the left side, which probably was caused by the sinking of the eye. The finger could be passed between the orbit and eyeball deeper than on left side. The power of the levator is destroyed; edge of lid covers the upper margin of pupil. Movement of the eye up is somewhat diminished; downwards is greater than normal; in other directions the movements are less rapid. The right eye lies 3 mm. deeper than the left, med. clear; emmet. Fundus normal; vision nearly normal $\frac{3}{4}$. Binocular vision not disturbed. Pressure in region of trochlea causes intense pain.

The second case was also a miner who was struck on the forehead with a lump of coal, so that he became unconscious. The right supra-orbital region and eyelids were swollen. After fourteen days he was able to open the eye, and then noticed that right was smaller than left. The deeper plane at which the right eye lies is striking. On upper edge of right orbit is a non-adherent cicatrix from supra-orbital notch to the outer canthus; the upper lid is sunken back, palpebral fissure narrower than left. Movement of lids normal. Movement of right eye is somewhat hindered except downwards, where it is greater than left. Eyeball is $\frac{2}{3}$ mm. sunken; med. clear; refraction slight hyp.; fundus normal; vision $\frac{1}{8}$. Though the patient thinks that prior to the accident the vision was good, we have reason to doubt it. Pressure against the orbit causes pain.

The third case was again a miner, also knocked down by a lump of coal; his face was pressed against a heap of coals, where he remained senseless. Bones of forehead in region of right eye are thickened, right lid closed and swollen. After fourteen days he could open the eye, and noticed that it was "smaller" than left. On upper margin of right orbit there is an adherent cicatrix from supra-orbital notch towards nose. Upper lid is deeply sunken in orbit, folds in the lid are lost; under lid is sunken with trench-shaped depression. Edge of upper lid is somewhat lower than the left and cannot be raised by patient. Power of shutting the lids is unimpaired, width of palpebral fissure is diminished about 2 mm. Movement of the eye up and inwards is somewhat diminished, downwards is increased. Palpation of orbit is remarkably easy; med. clear; emmet. fundus normal. It is only when he looks to right that homon. diplopia is found. Vision normal. Right eye is $\frac{3}{4}$ mm. sunken.

Gessner does not allow *a priori* the theory of Nieden as to the trophic disturbance of orbital tissues, but draws attention to the fact of there being always a wound, and thinks this is an easier explanation. He thinks that blunt violence applied on the sharp edge of the orbit causes a crushing wound of soft tissues right down to the bone, and the tendency of such wounding is to cause inflammation of the periosteum of the orbit and retro-bulbar fatty tissue. He does not think that inflammation and adhesion of muscles or adhesion of the eye to Tenon's capsule has anything to do with it, but that the enophthalmos is merely mechanical. The diminution of movements, as well as the insufficiency of the abducens, is caused by the laxity of the muscles when the eye is sunken back.

Von Becher ("Fall von Dislocatio Bulbi," *Archiv. für Ophthal.*, vol. xii., p. 289). Peasant's wife, 32 years old, came to his clinic on account of her left eye; upper eyelid appeared sunken, the half open palpebral fissure empty. When asked how she had lost the eye, said eye was not taken out, but driven into her head. Three months before a cow had struck her with its horn in the left eye; it was very painful, and bled a little, as did her nose on that side. Four days afterwards she recovered consciousness, and then wound was closed, eye severely painful, left cheek greatly swollen and ecchymosed, scarcely any sensation on left side of face, vision lost. Along upper margin of orbit was an adherent cicatrix running from puncta up to margin of orbit and then outwards along margin to outer canthus, in all 25 mm. long. Upper lid is greatly sunken; opening between lids 5 mm. The lower lid merely stretches across orbit. Under the upper edge of orbit is a white cicatrix in the conjunctiva. When lower lid is drawn down, the retrotarsal fold reaches up 3 mm., almost touching the fold of upper lid, which hangs down so that it looks like the socket of an enucleated eye. The finger can be passed backwards 20 mm. without any hindrance. When the lower lid is drawn down forcibly with lid holder, 2 mm. of the upper margin of cornea can be seen, with bluish iris, and even a small part of the somewhat widened pupil, all quite normal and sound; in the upper field patient can count fingers, eyeball is immovable. There is slight paresis of muscles of left side of face, teeth of left upper jaw are sensitive. Under narcosis—there is no foreign body pressing eye down—eye is rotated in and down, cornea being above the infra-orbital canal. In the inner and lower part of orbit the globe is very adherent, so that only after cutting away adhesion with scissors, could I examine the infra-orbital edge with a blunt-pointed probe. No attempt made to replace the globe, as diplopia was feared. Explanation was that horn had entered the orbit above and to the outer side, tearing conjunctiva; eye was then pushed forwards, thus escaping rupture; then passing behind the eye, the horn broke through the lacrymal bone, and perhaps through the roof of antrum of Highmore. A part of the soft tissues was driven into this aperture and became fixed, and the cicatricial contraction of this mass dragged the eye down after it, and fixed it in its present position. The branch of the oculo-motoris to the lavator palpebræ is uninjured, the other branches probably torn.

Lang ("Injuries and Diseases of Orbit.—1. Traum. Enophthal. with Retention of Perfect Acuity of Vision," *Transactions of Ophthalmological Society*, vol. ix., p. 41). Boy was struck in region of right eyebrow by pole of carriage and knocked down; he bled profusely from the nose, but was able to walk home. Wound was sutured at once, eyelids swollen and kept shut; when he could open the eye again, he found it was smaller than left. After a month he came to Mr. Lang, who thought it like an artificial eye. There was a non-adherent cicatrix of upper eyelid parallel to and below the edge of outer $\frac{2}{3}$ of orbit. Palpebral fissure 4 mm. shorter, and 4 mm. narrower than that of left; this more apparent when effort was made to open lids to widest. Right pupil pear-shaped apex down, 7·5 mm., iris sluggish, lower part quite immovable, vision normal, movements of eye diminished in all directions and therefore diplopia all round. Binocular vision only when head is held back, and looking straight forwards. Right cornea 8 mm. below left; right cheek and forehead seemed to have lost their sensibility; no alteration in bones of orbit; no pain on pressure. Teeth normal; no ephiphora, although canthus int. and caruncle are well in front of cornea. Lang divides cases into two groups: in "one the bulb is wholly invisible and can be found only after searching, as in Becher's case; in second group the eye is visible, but sunken back, so that it looks like an artificial one. He states that a cicatrix over the eyebrow, dragging backwards of the lids, narrow palpebral fissure, limited movements up, and increased movements down, will be found in four cases out of five, and that these are the principal signs of traumatic enophthalmos. He cannot accept Gessner's theory before it is proved by *post-mortem* examination. His explanation is that the trauma causes fracture or depression of orbital walls, that the pad of fat which is only sufficient to fill the retro-bulbar part of the normal orbit sinks into this depression, and therefore a vacuum results, and the eye sinks back merely by atmospheric pressure. As to the apparently increased movement down, he thinks this is explained thus: the rectus inferior, as well as causing the eye to look down, depresses the lower lid; the eye being removed from the lower lid this secondary action ceases, and so the eye appears to have a greater movement downwards.

Tweedy (quoted after Lang), in a case similar to Becher's saw a patient where the horn of a cow drove the globe through the floor of orbit into the antrum of Highmore. Eye was blind and enucleated with difficulty, owing to its adhesions. The fracture of the upper jaw must have been extensive, as patient could not chew on that side for a long time, and the teeth were very painful.

Langenbeck ("Versenkung des Augapfels, &c.," *Archiv. Ophthal.*, vol. xiii., part 2, p. 457). An engine fitter was caught between the tender and locomotive and the right side of his face crushed. The upper lid was torn both horizontally and obliquely, and dragged away from edge of orbit; lower lid was separated from lig. palpebra; a deep wound runs from inner canthus, through cheek to the upper lip. Through this wound the probe enters the antrum. There is no trace of the eye to be seen in the orbit; instead one finds a bluish-black, clearly pulsating vesicle, and it was thought that the greater part of the eye was torn away, and that this was the remains of the choroid. All the nasal bones are crushed.

After eight days, when the pain and swelling had somewhat abated, he found that the eye had escaped through an aperture a finger broad in the orbital process of the sup. max., and was in the antrum of Highmore. After the best possible re-position the eye showed itself uninjured, and the vision remained good till four months afterwards, when owing to a corneal ulcer the globe became atrophic.

Nagel (quoted from the *Berlin Krankheiten der Orbita; Graefe und Sæmisch Handbuch der Gesammten Augenheilkunde*, vol. xii., p. 507) observed a case where after a kick from a horse, which had broken the roof of the nose and inner half of edge of left orbit, enophthalmos was found; the eye was about 2·3 mm. lower and was 3 mm. drawn back.

Schapringer (in the *New York Medical Journal*, June, 1890) states a case which differed from all previous ones. A girl, 7 years old, was thrown down in the schoolyard and struck her right temple against an iron grating; she did not lose consciousness, but was very giddy; bleeding from nose and ear; this was at 10 a.m., at 12 when she came home her mother noticed that her right upper lid hung down, and that the eye was sunken. Right temple ecchymosed; this region is very sensitive. Right upper lid hangs down, covering more than half the pupil, lid is otherwise normal; in looking up the lid moves with the cornea; height of two lower lids is the same. Right eye lies deeper in orbit than the left. Difference of eyes in vertical plane is 2 mm. Pupil normal. Tension of right eye lowered. No disturbance in movements. No diplopia. Vision of both eyes apparently normal, also fundus; perhaps right retinal vessels a little enlarged. No disturbance of sensibility nor difference in skin capillaries nor in the temperature. Neither headache nor sensitiveness of skull on pressure. Schapringer says that of the symptoms the ptosis and enophthalmos are due to paresis of the sympathetic caused by the non-acting of that smooth muscle, discovered by Heinrich Müller and called after him. The ptosis can also come on from paresis of the levator palpebræ, but in the latter case the lid would remain fixed when the cornea was raised, whereas in the former case the lid is raised and depressed with the cornea. The decreased tension is due to a diminution in the intraocular secretion governed by the sympathetic; the tearing of or pressure on one of peripheral branches of the sympathetic as by an ecchymosis is quite sufficient to account for this phenomenon. The best explanation is that an injury took place in the sympathetic root of the ciliary ganglion; this root comes from the plexus in the cavernous sinus where it is fixed to the bone, then when the head is violently struck the nerve is dragged on and the peripheral branches suffer. This injury can take place, he says, in all degrees from the slight dragging on to the actual tearing through of the nerve.

The following day the ptosis was clearly better, the enophthalmos less marked, the difference in tension no longer so obvious. Three days later there was no difference between the two eyes. Schapringer regards his case as an undoubted proof that there is an enophthalmos due to lesion of the sympathetic nerve. He thinks it probable that in all the published cases there was no atrophy of fatty cushion or cicatricial contraction, but rather an injury to the peripheral branches of the sympathetic. In regard to the cases of Nieden and Gessner, he says enophthalmos was noted in all cases some time after the injury, but it was not certain whether it had come on directly after the accident or no.

Low ("Beitrag zur Lehre von Enophthalmos," *Berlin*, 1890) quotes the following case:—A 42-year-old guide had received a kick from a horse in the left eye. When he recovered consciousness after two days he could not open the eye on account of swelling of lids. On sixth day, when he could for first time open his eye, he found the sight had gone. To the outer side of the inner canthus, and from it straight up to the orbital margin is an adherent cicatrix sensitive to pressure. The left eye lay 6 mm. deeper in orbit than right, but distance appeared greater owing to thickening of frontal bone. Left side of forehead stood out further than right; the lower edge of orbit was deeper than right, and showed in its outer two-thirds a depression. Motion slightly impaired up, down and in; outwards there is no motion; pupil wide, not reacting. Med. clear; optic atrophy. Low thinks cause is same as in Gessner's case. No doubt there was injury of the orbital walls as proved by the adherent cicatrix; a cicatricial contraction of the retro-bulbar fat had taken place, and hence there was enophthalmos. He also thinks that the globe is attached by the cicatrices as shewn by the diminution in movement. This defect is too great to be accounted for by the laxity of the muscles. Optic atrophy is explained by (?) fracture of the optic foramen with tearing of the optic nerve.

Then as to the first case which was noted here in the Klinik Fuchs (Beer, "Studien über Traumatic Enophthal," Knapp-Schweigger's *Archiv. fur Augenheilk.*, vol. xxv.). A man, 42 years old, who was kicked by his horse in region of right eye, fell down senseless at once; in two hours recovered consciousness. The doctor who came at first sutured the two wounds; in skin injured part was much swollen so that patient could not open his eye. Eight days later when swelling was gone, and eye could be opened, he noticed that vision was impaired in right eye, and that the temporal field was very defective; no pains at this time, nor had they ever been very marked, but he complained of a "woolly feeling" in eye, especially in low temperatures. The sinking was only noticed by friends twelve days after accident. He came to the clinic on account of bad sight, but the sight had not diminished lately.

Present state of right eye: The inner $\frac{1}{3}$ of eyebrow formed with outer $\frac{2}{3}$ an angle of 120°, the outer part being horizontal; then 4 mm. above this angle the other cicatrix begins, and runs down and out to inner canthus. Where these cicatrices cross, the skin is dimpled but not adherent, while at this point a notch 1 cm. long and 1 cm. deep can be felt in the orbital edge. Outwards and below this notch is a small tumour the size of a pea and as hard as bone; 3 mm. outside the external canthus another cicatrix, non-adherent, runs down and out in a linear direction for 12 mm. Below this one can feel another shallow depression in the bone, and beyond these is another alteration in orbital wall. Pressure on no part of the orbit causes pain; patient has naturally rather deep-set eyes; slight ptosis, the palpebral slit is 3 mm. narrower (vert.) than left; this difference is increased when eyes are widely opened. Horizontally, the palpebral slit is 4 mm. shorter, the right globe is 7·5 mm. further back than left and 2 mm. lower. When patient looks up, the right eye remains stationary with lid downwards; the difference is the same as when horizontal; no defect inwards, slight defect outwards. Up and outwards is iridodialysis, pupil does not react either directly or consensually, very slight reaction on convergence; size. and tension of the right eye normal, vision $\frac{6}{36}$. Left normal; med. clear, edge of disc somewhat blurred, outer half a little paler.

Beer's second case occurred when he was mountain climbing in Styria; there he saw a boy, 15 years old, who had fallen head over heels on the side of the mountain and struck the lower part of his face against a stone; no external injury or loss of consciousness. Eight days after accident sinking of the eye noticed; no disturbance of vision.

Now the eye, although otherwise quite normal, is 3 mm. sunken ; upper lid hangs a little.

Dr. Beer was of opinion that in these two cases the enophthalmos was the result of shrinking of orbital tissues due to trophic nerve disturbance.

W. UHTHOFF (Marburg). The Ocular Complications of Syphilitic Disease of the Central Nervous System. II. (Clinical) Part. *v. Graefe's Arch., xxxix., iii., p.* 126.

In this sequel to his former papers, the author considers the clinical aspect of the ocular complications in his own 100 cases of cerebral syphilitic disease, and of those in the 150 published cases in which autopsies were made ; no doubtful case is included in his series of 100 cases, and in 17, autopsies were made. In giving the results of ophthalmoscopic examination, the author preserves the distinction of v. Graefe between choked disc and optic neuritis, a disc prominence of not less than $\frac{2}{3}$ mm. (2 diopt.) being taken as characteristic of the former condition. Atrophy of papilla is assumed to be secondary to optic neuritis when the history and appearances of the disc on ophthalmoscopic examination pointed to a preceding inflammation. When atrophy without signs of previous neuritis was seen, the term atrophic decoloration (*verfärbung*) is employed ; this may be either partial or complete. Ocular complications connected with the syphilis, but having no direct connection with its cerebral manifestations, are also mentioned. The results are given in the following table.

RESULTS OF EXAMINATION WITH THE OPHTHALMOSCOPE IN 100 CASES OF CEREBRAL SYPHILIS.

	Cerebral lesion was diagnosed as follows:—
(1) Choked disc or atrophy, subsequent to choked disc, 14 times: 13 times in both eyes, once in one eye only, once recurrent.	(*a*) Meningitis basalis syphilitica (gummosa) in 8 cases (3 confirmed by autopsies). (*b*) Gummatous tumours in cerebral cavity in 4 cases (3 autopsies). (*c*) Intra-cranial syphilitic disease of uncertain nature in 2 cases.
(2) Optic neuritis or atrophy, subsequent to neuritis, 12 times: 7 times in both eyes, 5 times in one eye only.	(*a*) Meningitis syph. basalis (gummosa) in 5 cases (3 autopsies). (*b*) Arachnitis gummosa on the convexity of one cerebral hemisphere in one case. (*c*) Syphilitic tumour in the post-cranial fossa in one case. (*d*) Intra-cranial syphilis of uncertain nature in 5 cases.
(3) Atrophic decoloration of the papilla 14 times; 10 times in both eyes, 4 times in one eye only. In 4 cases complete. In 7 cases paleness of the whole disc, yet with traces of a pink colour to inner side. In 3 cases paleness of temporal portion only.	(*a*) Meningitis syph. basalis (gummosa) in 10 cases (2 autopsies). (*b*) Gummatous tumour in left temporal lobe, and softening of left hemisphere in one case (autopsy). (*c*) Intra-cranial syphilis of uncertain nature and position in 3 cases.
(4) Other ophthalmoscopic changes 8 times. (*a*) Old choroiditis or irido-choroiditis 4 times (one autopsy). (*b*) Iritis gummosa in 2 cases (*c*) Diffuse opacity of both corneæ from keratitis interstitialis, and lues congenita in one case. (*d*) Leucoma adhærens of both corneæ (not of syphilitic origin) in one case.	
(5) Nothing abnormal on ophthalmoscopic examination 52 times.	Of these 52 cases, 7 had hemianopsia (5 homonymous and 2 temporal).

In three autopsies, where there had been no loss of vision and nothing abnormal on ophthalmoscopic examination, marked pathological changes in the basal optic conducting fibres were found. Counting in these and the 7 cases of hemianopsia, just 50 per cent. of the cases were affected.

In the 150 published cases—

Choked disc was present in 15 cases; in 14 of these in both eyes. In 8 there were intracranial gummatous tumours in the cerebrum or its meninges. In the unilateral case there was a tumour in the region of the sella turcica, and the left optic nerve between the foramen opticum and the chiasma was involved.

In 2 cases there was meningitis basalis gummosa, in one of these from lues congenita.

In one case there was syphilitic periostitis of both orbits.

In one other case hydrocephalus internus complicated with disease of the vessels, softening and basal meningitis, and in another syphilitic hydrocephalus; in this case there was simple optic atrophy without choked disc.

In 3 cases there was syphilitic disease of the vessels, with secondary softening and thrombosis.

This occurrence of choked disc following arterial thrombosis is exceptional, and is probably to be explained by the secondary venous hyperæmia and swelling.

On a general consideration of the 250 cases, it will be seen that choked disc occurred in about 12 per cent. It is nearly always found in both eyes, and if in one only, is usually caused by gummatous disease of the sheath of the nerve involved. The most frequent cause is intracranial gummata; next to this in point of frequency basal meningitis (gummosa). Occasionally it may occur from disease of the cerebral vessels, with secondary softening in the cerebral substance, and very rarely from syphilitic periostitis of the orbits.

The choked disc may disappear, leaving almost no traces, or some atrophy of the disc, with, however, relatively good vision, may result; in some rare cases there may be recurrence. Typical choked disc in syphilitic cases is very nearly always secondary to intracranial complications, though in some rare instances it may be primary.

Optic neuritis or post-neuritic atrophy occurred in 12 per cent. of the author's cases. It was often unilateral, and the loss of vision was usually much greater than the ophthalmoscopic appearances led one to expect, owing to the fact that this condition was often secondary to disease in the more central parts of the visual tracts.

In the 150 published cases, this affection was only recorded nine times.

Though it must be admitted that optic neuritis may be primary in syphilis and not a consequence of cerebral or orbital disease, it is evident from the observations of many authors that it rarely is so.

Simple atrophic decoloration occurred in 14 per cent. of the author's cases, in the 150 published cases it occurred only 10 times, and unfortunately the information given in many of these cases is very slight.

The other ocular changes which occurred in 8 per cent. of the cases cannot be said to be in any way characteristic of cerebral syphilis. It is noticeable that pathological changes in the retinal vessels were almost never detected by ophthalmoscopic examination, though in one case they were found *post-mortem;* cases in which such changes occur are therefore probably rare, more especially as the retinal hæmorrhages and alterations which might be expected to accompany them were never seen.

The clinical observations of defective vision noted in the 100 cases are given in the following table :—

(1) Hemianopsia. (*a*) Homonymous 11 times.	Of these 4 were plainly basal in character, and in 2 cases symmetrical narrowing of the other half of the field occurred later.
(*b*) Temporal 6 times.	Twice on both sides; 4 times unilateral, with amaurosis of the other eye.
(2) Concentric narrowing of visual field more or less regular, 5 times.	Twice on one side only (in one of these cases there was central scotoma in the other eye), 3 times in both eyes.
(3) Preservation only of a peripheral field, either wedge-shaped or shaped as the segment of a circle, 4 times.	Twice with amaurosis of the other eye; twice on one side only.
(4) Central scotoma with relatively good peripheral vision, 4 times.	Twice on one side only (in one of these cases there was concentric narrowing of the peripheral field. Twice on both sides, but in one of these there was probably a toxic amblyopia.

(5) Marked enlargement of blind spot, with relatively good peripheral vision, 7 times.	In all the cases on both sides and with choked disc on ophthalmoscopic examination.

In the 4 cases of hemianopsia where the lesion is given as basal in position, this diagnosis was arrived at by the cerebral, and more especially the ocular nerves involved. In two of these cases the gradual narrowing of the other half of the field in each eye can only be explained by such a lesion by degrees involving the chiasma; in these cases this narrowing commenced, as would be expected, in the eye on the same side as the lesion; in all 4 cases there was atrophic decoloration of the disc to a greater or less extent. In the other 7 cases of homonymous hemianopsia the lesion was more central; in 5 the fundus was normal, in one there was choked disc, and in one only possibly slight atrophic decoloration; atrophy of the disc therefore is in favour of the diagnosis of a basal lesion.

The large number of cases of heteronymous hemianopsia is remarkable, and on adding his results to those he has been able to collect, the author finds that syphilis is accountable for about 20 per cent. of all cases of this form of hemianopsia. In two of these, though there was for a time total blindness of both eyes, under treatment some vision was restored. In 2 cases there was optic neuritis, in 2 atropic decoloration, and in 2 the fundus was found normal. Of the 2 normal cases one died soon after the hemianopsia set in, the other got rapidly well under treatment, so that there was not time enough for the occurrence of optic atrophy, the presence of which must, in these cases, be regarded as the rule.

Of the 5 cases of concentric narrowing of the field, 3 were examples of double choked disc with subsequent atrophy, and of the 4 cases where a part of the field only was preserved, 2 showed choked disc in both eyes. Of the 4 cases of central scotoma, one was probably toxic. These scotomata, caused probably by a lesion in front of the chiasma, are in syphilis comparatively rare. Visual defects seem to have received but little attention in the 150 published cases. Homonymous hemianopsia is mentioned twice, temporal hemianopsia only once; there was also one case in which nasal hemianopsia of the right eye, with total blindness in the left, was caused by destruction of the right optic tract and of the uncrossed fibres of the left tract.

The defects of vision in cerebral syphilis present characteristics which may be of service in differential diagnosis. Permanent total blindness is rare; it occurred but once in the 100 cases; the percentage of hemianopic defects is very large, and so is the number of cases in which only one eye was affected. The improvement in vision is often very remarkable, as is the number of instances in which with defective vision the results of ophthalmoscopic examination were negative.

W. G. STORY.

(*To be concluded.*)

VIALET (Paris). The Cerebral Visual Centres, and the Intra-cerebral Nervous Apparatus of Vision. *Révue Gén. d'Ophtalmol., December*, 1893.

This article, as it appears in the *Révue Générale*, is a *resumé* by the author, of a book of some 350 pages with numerous illustrations.[1] Several of the figures are reproduced in the *Révue*.

As it is impossible in a review to do justice to the paper, without the aid of the plates and diagrams, we shall give merely a brief note of the nature and scope of Dr. Vialet's work. Those who are interested in the subject will do well to consult the original treatise, in which the author gives a very careful account of his own researches and a detailed discussion of our present knowledge of the cerebral visual apparatus.

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[1] Published by Felix Alcan, Paris, 1893.

Vialet had the opportunity of examining the brain in five cases of hemianopsia. In Case 1 the only symptom was left homonymous hemianopsia. The autopsy revealed an old yellow *plaque*, which to the naked eye appeared limited to the anterior fourth of the right cuneus. Microscopic examination, however, showed that the area of atrophy was more extensive, including the anterior two-thirds of the cuneus, the front half of the calcarine fissure, the lower part of the internal perpendicular fissure (*i.e.*, the mesial portion of the parieto-occipital) the peduncle of the cuneus and reaching to the *pes hippocampi*. Secondary degeneration was traced into the optic radiations and the inter-hemispheric fibres.

The second case resembled the above, in that the only symptom was homonymous hemianopsia. The lesion consisted in an area of softening, involving, though unequally, the entire cuneus and encroaching, very slightly, on the lingual gyrus.

The third case was one in which, in addition to complete right hemianopsia, there was a variety of word blindness; the patient could not read a single word; he could, however, write spontaneously and from dictation. At the autopsy the lesion, to the naked eye, involved the base of the cuneus and the posterior part of the lingual and fusiform (lateral occipito-temporal) gyri. Microscopic examination showed that there was softening of the white substance underlying the calcarine fissure in its whole length.

The remaining two cases were examples of the usual form of word blindness, accompanied by hemianopsia. In the first of these the lesion was a large one on the outer surface of the hemisphere involving the first and second temporal convolutions, the *pli courbe* and the greater part of the outer surface of the occipital lobe. The destruction was not limited to the cortex but extended deeply into the white substance beneath.

In the other case the softened area was much less extensive; it was limited to the *pli courbe*, not larger than a five-franc piece, and at first sight appeared to be a purely cortical lesion; but further examination showed that there was disorganisation extending into the optic radiations. Both these cases support the views that hemianopsia accompanying word blindness is due to destruction of the deep intra-cerebral visual fibres.

In the first three cases which were instances of uncomplicated hemianopsia the lesion was limited to the mesial surface of the occipital lobe in close proximity to the calcarine fissure.

Vialet holds that the cortical centre of vision occupies the mesial surface of the hemisphere between the following boundaries: in front the internal perpendicular fissure; above the superior border of the hemisphere; below the inferior margin of the third occipital convolution; behind the posterior pole of the occipital lobe. The anterior boundary is the least definite. In the area thus marked out, the cortex immediately adjoining the calcarine fissure possesses a special importance; it has a large arterial supply (the calcarine artery running along the fissure) and, according to the author, represents the centre of the visual area in man.

J. B. L.

LEEDHAM-GREEN (Birmingham). On the Goblet Cells of the Conjunctiva. *Von Graefe's Archiv., vol. xl., part* 1, *p.* 1, 1894.

The occurrence of the so-called goblet cells in the conjunctiva has long been recognised, but the exact nature of these bodies has not hitherto been accurately determined. By the majority of writers they are spoken of as epithelial cells which have undergone pathological metamorphosis, while by others they are regarded as unicellular glands, analogous to those which are found in other kinds of mucous membrane, and in the outer skin of fishes, amphibians, &c. In order to decide this question, the author made, at the suggestion of Professor Leber, and in his pathological laboratory, a series of observations on the conjunctiva of men and animals. The series included portions of conjunctiva from thirty human eyes, of which two were fœtal at the eighth month, two of new-born children, ten of children of various ages, and the remainder of adults. It included also the conjunctiva of rabbits, cats, dogs, sheep, pigs, rats, guinea-pigs and mice. By special methods of preparation and staining, the goblet cells were rendered clearly distinguishable from the surrounding tissues.

The results may be summarised as follows. Goblet cells are always present in the normal human conjunctiva at all periods of life, and in that of the animals above mentioned. They are of regular oval form, being about 0·025 mm. long, and 0·016 mm. broad. Each cell has a sharply defined cell membrane or theca, distinguishable as a membrane by its double outline and possessing considerable firmness and elasticity. Some of the cells, though not all, have a foot or stem which is longer in the more superficially placed cells than in the deeper lying. The contents of the cell are of mucoid character, and stained by thionin. The nucleus surrounded by more or less protoplasm lies at the deeper end of the cell and at the opposite end a sharply defined opening or stoma is formed when the cell reaches the surface of the conjunctiva. Through this it discharges its contents.

The goblet cells are numerous in the bulbar conjunctiva and in that of the fornix: towards the edge of the lids their number decreases, and they are entirely absent from the epithelium of the cornea. They appear to develop in the deepest layers of the conjunctival epithelium and to mount thence gradually to the surface. In their earlier stage they appear as small round vesicular cells, with protoplasmic contents which give no mucin reaction. As they approach the surface they become longer and more oval and their contents become mucoid; on reaching the surface the stoma is formed and the contents are expelled.

They are more numerous in the conjunctiva of the cat and rabbit than in that of the human eye, but the same description applies to all.

The author proved experimentally that in the eye of the rabbit, the number of goblet cells was not increased by the presence of a chronic conjunctivitis. His observations appear to prove beyond question that the goblet cell is not the product of any pathological process, but is a normal constituent of the conjunctiva, as of other mucous membranes and is concerned in the physiological production of mucus.

The paper is illustrated by a series of drawings of goblet cells.

P. S.

T. D. DUNN (West Chester, Pa.). Leukæmia, with Rare Lymphoid Growths of Orbits and Parotid Glands. *Transactions of the College of Physicians of Philadelphia*, 1893, *p*. 103.

Dunn reports a case of this rare condition observed by himself, with abstracts of cases reported by Chauvel, *Gazette hebd.*, No. 23, 1877; Leber, *Archives of Ophthalmology*, 1877, No. 24, p. 295; and Osterwald, *Archives of Ophthalmology*, 1881, No. 27, p. 203. Dunn's case occurred in a boy 8 years old, who was first seen for a stubborn conjunctivitis. Although slightly anæmic at the time, he seemed to enjoy good health; he made a complete recovery from scarlatinous nephritis a year before, and, though not a robust child, he was yet far from an unhealthy one. He was unusually intelligent and studious.

Six months after this he suffered from a swelling in the left parotid gland, well defined, immovable, not tender and slightly adherent to the skin. A month later this had enlarged, and the lymphatic glands of the left side of the neck were involved. During this period, anæmia and loss of flesh steadily progressed, in spite of regulated diet and the use of iodide of iron. Soon the axillary and inguinal lymphatic glands began to enlarge; and three months after he was first seen with the parotid swelling, a hardness began to develop over the eyes, with slight thickening in both temporal regions.

In four months the patient suffered from attacks of pain in the splenic region ; the left parotid was greatly enlarged and of stony hardness, and there were crescentic bodies over either eye, not firmly connected with the lids, beginning at the nasal end of the orbit and extending outwards beyond the external canthus, the larger end being to the nasal side. These were of marked hardness, but somewhat elastic, free from tenderness, slightly attached to the lids, but firmly attached to the orbital arches. They caused considerable exophthalmus, but only partially interfered with the motion of the lids. There was no conjunctivitis, and vision remained normal. The only other growths were similar, but flat, hyperplasias in each temporal region.

The blood under the microscope showed one white corpuscle to 15 red, 1,830,000 corpuscles to the cubic millimetre and about 30 per cent. of hæmoglobin. The growths increased, the anæmia and emaciation continued to progress with increasing deafness, but vision remained good until his death six months after the first growth in the left parotid was noticed. No ophthalmoscopic examination was made and no autopsy, but from the clinical history, the nature of the case appears to be clear.

Osterwald's case also occurred in a boy aged four years; those of Chauvel and Leber in middle-aged men. In all these latter, vision was impaired and hæmorrhagic retinitis was present. In Chauvel's case, the left eye was entirely closed by the swelling, and in Osterwald's, the tumours were found to consist of elements analogous to those of a lymphatic gland, a reticulated tissue infiltrated with leucocytes.

It is quite possible that such growths in the orbit are a more common attendant of leukæmia than the scanty literature about them seems to indicate. Those heretofore reported by ophthalmologists have shown impairment of vision. If, as in this case reported by Dunn, vision remains good, the orbital growths appearing after the nature of the disease has been indicated by other symptoms, they may not be brought to the notice of the ophthalmic surgeon.

E. J.

W. F. NORRIS and JAMES WALLACE (Philadelphia). A Contribution to the Anatomy of the Human Retina, with a Special Consideration of the Terminal Loops of the Rods and Cones. *University Medical Magazine, April*, 1894.

Norris and Wallace refer to the difficulty of obtaining material for careful histological study of the human retina. The structures that have been commonly figured for the retina have usually been observed in the eyes of the lower animals. The material used for this study was obtained from an eye promptly removed for a foreign body that had penetrated it, hardened in Müller's fluid, stained with carmine, and embedded in paraffin.

The anatomical relations of the retina, and the need for distinct, definite sensitive points, in the percipient layer, allow no other explanation of the mechanism of the visual act than that this layer is the one containing the so-called rods and cones.

In 1887, Borysiekiewicz in a monograph on the structure of the retina based upon his study of the eyes of the members of the cat tribe, as well as the human eye, denied that the rods and cones were the end organs of the optic nerve, and placed the percipient elements in the intermediate layers. Norris and Wallace, however, point out that the percipient layer must possess elements of a certain, definite and uniform area, and symmetrical arrangement. As has previously been shown, the layer of rods and cones alone conforms to these requirements. Homogeneous immersion lenses resolve each of the cones into two or more bodies, each corresponding to at least an angle of 24″ for the limit of separate perception, which agrees with the results of daily experience.

The twin cones have long been known in the retina of frogs and fishes, but seem never to have awakened the idea of the looped determination being a recurrent nerve fibre. Heinrich Müller noted fine fibres on the points of the ends of the rods not directed towards the choroid, but turned inward; and Pacini stated that the outer end of a rod bends on itself like a hook and connects with the end of a cone, but in spite of such fidelity of description, the function of these organs still remained obscure.

The preparations made by Norris and Wallace show that the cones terminate in a looped extremity which passes down over the body of the cone, and, after some convolutions in the position of the so-called external limiting membrane, winds along among the elements of the outer nuclear layer. They also show a marked difference in the length of the cones, some of them forming their loops much nearer to the external limiting membrane than do others. The terminal loops of the cones are distinctly seen in osmic-acid preparations, but do not appear in the photographs prepared from them on account of the peculiar colour assumed by the retina, which renders it difficult to give a good photographic reproduction of them.

A fine longitudinal striation has been observed by many investigators on the bodies of the cones, and the necks of the cones have been seen in the eyes of fishes to possess a series of transverse markings, which presumably was due to their structure being composed of disc-like bodies. The longitudinal markings can be traced from nearly the bases of the cones, and are seen to undergo a twisting, that on the necks of the cones produces the transverse striations which have previously been described in the eyes of fishes. As the neck recurves and passes down over the body of the cone as a fibre, we can see the portion of the cone over which it passes transversely striated; in some places we thus have transverse and longitudinal markings side by side. The transverse striations do not end in the layer of cones, but are plainly visible among the fibres of the outer nuclear layer. They may be followed into the optic nerve by this characteristic spiral wrapping. In the internal granular layer, the investment of the fibres with this covering seems to be reinforced, while other fibres passing at right angles form an arrangement resembling wicker-work. In the layer of optic nerve-fibres a similar arrangement may be observed.

The great difficulty in seeing the looped extremities of the cones arises from the fact that they are buried in the pigment, and when the pigment has been torn off, the ends of the organs are usually mutilated. They are extremely delicate, and even very light pressure of the immersion lens against the cover-glass will cause their complete destruction. It is not possible to follow their outlines through the pigment.

Norris and Wallace regard their specimens as very successful in the separation of the pigment epithelium from the extremities of the cones without any violence to the structures being done. The paper is accompanied by photomicrographs, made with a $\frac{1}{15}$ Reichert oil immersion lens, which illustrate fairly well the double character of the cones.

E. J.

FLAVEL B. TIFFANY, M.D. (Kansas, U.S.A.) Anomalies of Refraction and of the Muscles of the Eye.

This work deserves well of the ophthalmological world for the excellence of its type, and the completeness of its index, two factors which materially add to the utility of any surgical treatise. It is also profusely illustrated with nearly 200 plates or figures in the text, some perhaps more ornamental than useful. Another point in which this work differentiates itself from most of the books on the subject, is in the absence of mathematics and mathematical formulæ, which, although detracting from the scientific completeness of the treatise, certainly renders it more intelligible to the ordinary British and American student whose mathematical education is usually extremely imperfect.

Some thirty pages are devoted to the reflection and refraction of light, and ten to the dioptrics of the human eye. After this emmetropia and ametropia (with a long chapter on the methods of testing), accommodation and astigmatism take up some 140 pages. A short chapter on anisometropia, aphakia and presbyopia follows, then thirty pages devoted to heterophoria, a chapter on strabismus, and one on spectacles.

The general work of the book is substantially in harmony with the principles of modern ophthalmology, and we shall only call attention to some obvious errors which will doubtless be corrected in the next edition. It is not correct to state that "the smallest visual angle under which an object can be distinctly seen by the eye is one of 5′ (five minutes)," although it is true that Snellen's test types subtend an angle of five minutes at the distance laid down for the respective letters. It is, perhaps, a more serious error to define the angle alpha as formed by the crossing of the visual line with the optic axis. Every modern authority on the subject defines the angle alpha as formed by the visual line, and the major axis of the corneal ellipse, which may or may not coincide with the optic axis. The angle gamma again is not correctly defined as formed by the optic axis and an imaginary line drawn from the object of fixation to the centre of rotation. The latter line is one leg of the angle, but the other is formed by a line joining the corneal centre to the centre of rotation. It cannot be assumed that the centre of rotation always lies on the optic axis.

In the chapter on "How to examine the Eye," some statements require correction. In myopia the observer can see the retinal vessels moving against the movements of his own head, no matter what the mirror employed. From the statement in the text, it would seem as if this only held good when using a concave mirror. The subject of retinoscopy requires more accurate handling. Myopic movements are not to be seen by an observer at 1 m. distance if the myopia is more than 0·5D. The far point of a myope of 0·5D would be just 1 m. behind the observer's head!

It is again a mistake to state that the hyperopic eye has to exert a greater amount of convergence when looking at a near object than the emmetropic; the reverse is the case.

We feel sure that errors such as the above will disappear in subsequent editions.

THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MAY 3, 1894.

D. ARGYLL ROBERTSON, M.D., F.R.S.E., President, in the Chair.

On Periodical Testing of Eyesight in Schools.—Mr. Priestley Smith read a paper on this subject. Authorities were agreed that advantage would accrue from an annual testing of the eyesight of school children, and several commissions had spoken to this effect, and formulated definite proposals. Hitherto no considerable advance had been made towards this end, for the proposals usually put forward had been that the refraction of every scholar should be ascertained once a year by the school doctor. It would be a long time before every school had its school doctor and every school doctor was an efficient oculist. The necessities of the case could be met more easily, and would, he hoped, be so met in a large number of schools throughout the country before long. The governors of King Edward VI.'s schools in Birmingham, which comprise about 2,200 boys and girls aged from 8 to 19, had established, three years ago, a periodical physical examination of the scholars in regard to height, weight, chest measurement, eyesight, and hearing. The eyesight test was carried out by certain teachers appointed for the purpose. It made no pretence of being a scientific proceeding; there was no attempt to estimate refraction or diagnose disease. Any such attempt was worse than useless unless the examiner were an ophthalmic expert. In every case in which the vision in either eye was less than $\frac{6}{18}$ths, an intimation of the fact was sent to the parent, and with him rested the responsibility of obtaining the necessary advice and choosing the adviser. The Anthropometric Committee, appointed at the last meeting of the British Association for the Advancement of Science, having Professor Cleland and Professor Windle for its chairman and secretary, had lately issued an enquiry to a large number of schools as to whether, and to what extent, periodic physical examination of the scholars was in force. From the replies received, it appeared that the eyesight was tested in eight out of 483 boys' schools in England, Scotland, and Ireland (Whitaker's list); and in six of 129 girls' schools in England; while colour vision was tested in three only of the whole number. Many of the principals, however, expressed willingness to take up anthropometric work on receiving directions for carrying it out. The speaker laid before the meeting the printed directions which had been drawn up, and which were to be sent, in the first instance, to about 200 schools. The eyesight test included in this scheme was practically the same as already in operation in the King Edward's schools in Birmingham. It involves practically no expense, and very little trouble to the school authorities, and it interested at least one teacher in every school in the eyesight of the scholars. In advocating this system, the speaker did not in the least undervalue the importance of a thorough medical examination of schools, and he knew that many schools already had duly appointed medical officers competent to deal with errors of refraction, but these were exceptions. By making this simple eyesight test a part of the anthropometric scheme, now being so energetically pushed by the Committee of the British Association, they would, he was confident, attain the desired end in a large number of schools, where it could hardly be attained in any other way.

Tests of Vision.—These tests will serve to detect the presence of certain common defects of vision. Such defects are often overlooked or disregarded, to the permanent detriment of the pupil. The tests will not reveal the nature or cause of a defect. This can only be determined by an expert.

(*a*) *Acuteness of Vision.*—(1) Hang on the wall, in a good light, a set of Snellen's test letters; these are in general use, and afford records which can be universally compared. *No others should be substituted for them.* (2) Draw a line on the floor at a distance of exactly six metres from the letters, and let each pupil in turn toe this line and try to read the letters, line after line, beginning at the top; in all cases without spectacles or eye-glasses. Each eye is to be tested separately, the other eye being covered, but not pressed upon, by a large card held in the pupil's hand. (3) Record the vision of each eye separately in the form of a fraction, for instance, thus:—

$$\text{R. V.} = \frac{6}{6}$$
$$\text{L. V.} = \frac{6}{18}$$

The numerator is in all cases 6, *i.e.*, the distance of the letters in metres; the denominator is the number which stands over the lowest line of letters which can be read. When the vision is less than $\frac{6}{60}$ it should be recorded by the appropriate sign, viz.: $V. < \frac{6}{60}$. (4) Take care that the pupils have no opportunity of learning the letters by rote.

Note.—When the vision of either eye is found to be represented by a fraction having a denominator of more than 18, it will generally be desirable to report the fact to the parent or guardian, in order that proper advice may be obtained, such report being omitted if this has already been done.

(*b*) *Colour Vision.*—(1) Use Holmgren's series of coloured wools. (2) Place them in a heap on a white cloth, in a good light. (3) Lay, apart from the heap, the test skein —a pale, pure green. (4) Explain to the pupil that he is to select from the heap and place beside the test skein, all those which appear to him to be of the same kind of colour. Do not require him to name them or match them exactly, but to select those which are most nearly like the test skein in colour. (5) Mix the wools again for each pupil, but always use the pale pure green as the test.

A certain number of the pupils—boys, very rarely girls— will match the test-skein falsely with buffs, pinks, and other colours which have no green tint, or will hesitate much before rejecting such. These pupils are more or less colour blind, and are thereby permanently unfitted for vocations on land or sea which require good colour vision. Record the defect.

Note.—Ascertain by this same test that the person who conducts the colour-testing is not himself colour-blind. Such cases have been known.

The *Acuteness of Vision* of each pupil should be tested once a year, since certain defects of eye-sight commonly begin during school life.

The test for *Colour Vision* need not be repeated, since colour-blindness, except that which occurs with disease of the eye, is congenital, not acquired.

The President thought that the proposed scheme might be of great value in throwing light upon the refractive changes going on in the eye in school life. In addition to the proposed examination, he thought it necessary to test the near point of vision for the detection of hypermetropia and defective convergence.

Mr. Holmes Spicer did not understand whether Mr. Priestley Smith's paper applied to elementary schools or not; in the case of the elementary schools, he thought that leaving the duty of remedying the defects of vision in the hands of the parents would end in many cases in their not being remedied at all. It was in the lower grade schools that the examination was most necessary; in one school of 500 pupils that he had examined lately in the east end of London, he had found 40 per cent. of the children, whose acuteness of vision was less than one-half of the normal; the defects were now being treated, but such systematic examination and treatment took a considerable amount of time.

Mr. Doyne dwelt upon the difficulty of obtaining the near point of distinct vision in children.

Mr. Simeon Snell spoke of the difficulty of obtaining a systematic examination of the eyesight in schools owing to the want of appreciation of the teachers; he thought this was greater in the middle class than in the elementary schools.

Mr. Priestley Smith, in reply, said it was the higher schools which were likely in the first instance to adopt these tests. He was conscious that the matter was beset with difficulties, as had been pointed out; were it otherwise it would long since have been satisfactorily settled. Referring to the demand which had been made more than once that every school should have its medical officer, who should either periodically examine the children's eyes himself, or call in a specialist for the purpose—that would be very difficult to realise. It was important not to aim too high. An examiner, whether lay or medical, who should attempt to use test glasses without a thorough knowledge of refraction, would do harm rather than good by giving to parents a false feeling of security that their children's eyes had been examined with the necessary skill. He had sought to avoid every unnecessary technicality in the test, and to make it clear that it was not a medical examination. He thought that placing the limit below which defects of vision should be reported at $\frac{6}{18}$ would meet the case fairly well. It would catch quite low degrees of myopia, and though it would not catch all the hypermetropes these would, as a rule, take care of themselves by complaining when any real difficulty existed. It was the progressive myopia which was so commonly neglected that they particularly wanted to catch.

On Three Cases of Tubercle of the Iris.—Dr. Arthur Sandford read notes of three cases. The first two were examples of iritic tuberculous deposits coincident with fresh lung trouble of a similar nature. In one case the latter was a first attack, and in the second was a renewal of tuberculous activity in an old dried-up cavity. The third case was one of primary iritic tuberculosis, the ciliary region, suspensory ligament, and apparently the lens itself being infiltrated by the tuberculous elements. The case occurred in a child aged 5 years, of tuberculous parentage on both sides, whose only brother died of tuberculous meningitis. There was no evidence of tuberculous mischief in any other organ. The globe was therefore excised and sections made. The tuberculous mass half filled the anterior chamber. The patient improved greatly in health, and had been under observation ever since (eight years). At present she was a fragile, delicate-looking girl, but free from any special ailment.

Mr. Johnson Taylor was of opinion that in all cases of primary tubercle of the iris the eye should be excised; in secondary tubercle—that is, where other organs were involved—nothing should be done.

Dr. Hill Griffith said it had been shown that practically all cases of intraocular tubercle were secondary. It was not possible in any given case to say whether the affection in the eye was primary or not; he did not think such eyes should be excised always, as in many instances slowly-growing tuberculous formations in the iris yielded to treatment, and left an eye with useful vision.

Intra-cranial Abscess arising from Caries of the Sphenoidal Cells.—Notes of this case were read by Dr. A. Sandford. The abscess caused double optic neuritis and subsequent post-neuritic atrophy, with complete blindness, about twenty-seven years before the patient's death, which took place in the Cork District Lunatic Asylum at the age of 78 years. The left half of the skull was exhibited, showing situation of the abscess, which had penetrated the left orbit, causing proptosis, and also the outer wall of the skull by erosion of the bone. Internally the tumour had raised up and stretched the optic nerves and commissure.

A Rare Form of intraocular Melanoma.—This paper was read by Mr. John Griffith. After giving a brief account of the clinical history of the case, he described in detail its microscopic appearance. He considered the tumour to be epithelial, starting in the tapetum nigrum of the retina, for there could be no doubt that the cells were not sarcomatous, their size, shape and arrangement having nothing in common with those of sarcoma. The ciliary body was not invaded, but merely displaced inwards by the tumour pushing its way into the lymph space to the outer side of the ciliary muscle. He referred to the works of Mr. Treacher Collins, who had shown that primary epithelial melanomata may take their origin in the ciliary glands. Mr. Griffith, however, did not believe that in his case the growth had originated in this way; he thought it was an instance of a melanoma springing from the retina, and, as it was malignant in nature and epithelial in structure, it conformed rather to the type of carcinoma, although it possessed many features unlike that class of new growth. He saw no reason why epithelial melanomata should not originate in either the retina, the ciliary body, or the iris.

Card Specimens.—The following were the card specimens: Mr. Hartridge: A Case of Strumous Keratitis.—Mr. J. A. Warner: Two Cases of Ectopia Pupillæ.—Dr. Argyll Robertson: A Case of Trichosis Bulbi.—Mr. Rockliffe: A Case of Diabetic Retinitis.—Mr. Simeon Snell: Spectacles for Entropion.—Mr. Mackinlay: Cyst of Iris.—Mr. Donald Gunn: Growth at Yellow Spot.

LATENT TORSION OF THE EYES.

By Ernest E. Maddox, M.D.

Manifest torsion of the eye in cases of ocular paralysis has been well studied, but the physiology of torsion, apart from paralysis, is not yet fully understood. Le Conte, in his admirable book on "Sight" (1881), relates how he can prove outward torsion of his two eyes during *convergence* of the visual axis, when the desire for single vision is suspended. He produced the requisite dissociation by his rare power of creating, at will, a strong convergent strabismus, and quotes Meissner as having previously demonstrated the same outward torsion by a different and more doubtful method in 1858. Le Conte found great difficulty in applying his test to others, because so few possessed his power of dissociating their eyes so as to produce a convergent squint. He says: "To generalise this as a law of ocular motion I have found extremely difficult because there are so few persons who are able to verify the results." There is a plan, however, which I adopted when I first read his book, which enabled me to confirm his results on myself, and which anyone can easily manage. With a prism of 6° d., edge out, before the right eye, look at a vertical line drawn on a piece of paper, and held at the near point of vision. Then suddenly rotate the prism to the vertical. The two images of the line are seen to cross each other at a small angle as they meet, before the eyes have time to fuse them.

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By rapidly rotating the prism, sufficient time for fusion is not given, and the angle can be easily observed. The experiment may be varied by holding the line horizontal when a weaker prism held vertical to start with will suffice. A variation in the test is to draw a straight dotted line, and also a continuous red line parallel with it. These should be held horizontally with a vertical prism before the right eye of such a strength as to bring the false image of the dotted line over the true image of the red. There is so little tendency to fuse these two that the slightest angle between them can be leisurely observed. By drawing the two lines at various inclinations to each other, instead of being parallel, the angle can be accurately measured. Dr. Savage's plan is to use my double prism before one eye of the patient, while a horizontal line at eighteen inches is made the object of fixation, and this is really a very good test.

But I do not think torsional anomalies should ever be diagnosed without also making a *distant vision* test. With a rotating prism, any straight line on a uniform ground, at 6m. distance, will serve the same purpose as the near vision test, or the patient can be made to look at a flame, 6m. distant, through a glass rod, six inches long, and $\frac{3}{4}$ in. thick, held horizontally before both eyes. One streak of light is then visible, till resolved into two by placing a 6° d. prism, edge out, before the right eye. Rapid rotation of the prism to the vertical and back again enables one to see if the two streaks of light are parallel or at an angle. In my own case, their upper ends are slightly inclined to each other, showing slight lateral torsion in whatever position the head is held. Le Conte showed that, in near vision, the outward rotation of the eyes increases on looking upwards and decreases on looking downwards, and this made him attribute the phenomenon to over-action of the inferior obliques. It is safer, however, I think, not to commit ourselves entirely to either "insufficiency" or "over-action" of the obliques, since other muscles besides the obliques are concerned in torsion. Moreover, I prefer to think of the faculty of torsion, when exerted in the interests of fusion, as a definite co-ordinative faculty just as convergence is, so that it seems to me better to speak of latent torsion, rather than of "insufficiency of the obliques."

Dr. Savage has shown that a certain amount of corrective torsion, or, to substitute his own words, of "harmonious symmetrical action of the obliques" is necessary when oblique astigmatism exists in both eyes, since the retinal images of vertical objects are not themselves vertical, and that correcting cylinders which make these images vertical alter the torsional requirements. These facts may well have the practical bearing he claims for them. Of latent torsional anomalies sufficiently great to be called pathological, I have no experience, apart from definite paralysis of individual muscles, and therefore confine my remarks to the physiology of the subject. The torsion of the eye, as we all know, is of much value in the differential diagnosis between paralysis of the superior oblique and inferior rectus, as well as in the attempt to discover whether the fourth nerve is involved in a case of paralysis of the third. How to measure this torsion by the rod-test I have already shown in a previous paper. As regards latent torsion, it is important to bear in mind that in *near* vision, *apparent* insufficiency of the obliques is just as physiological as latent deficiency of convergence, and in distant vision slight deviations are not unphysiological. Only extreme cases should, I think, be regarded as likely to cause asthenopia, but as they are not personally familiar to me, I cannot express myself strongly on the point.

PRIMARY MELANOTIC SARCOMA OF THE EYELID, WITH REPORT OF A CASE.

By M. W. Zimmerman, M.D.

Ophthalmic Surgeon to the Germantown Hospital, Philadelphia.

The following case came under my care at the Wills Eye Hospital during August, 1892. I am indebted to Dr. A. D. Hall for permission to report it.

The patient was a sailor, aged 50, who had an exceptionally good personal history. One sister had an abdominal tumour, otherwise the family history was entirely negative. Ten months before he came he had noticed a swelling in the left upper lid, near the external canthus. There was slight itching, but no pain until shortly before I saw him. Growth was extremely slow until about one month ago, but after that it became much more rapid. There had been no hæmorrhage. While the tumour was still small the patient applied for treatment at another hospital, where a piece was excised, and after examination pronounced benign.

On admission, the outer half of the left upper eyelid was the seat of a tumour of dull bluish colour, 1 cm. long, oval, and of moderate height. It reached to the lid margin, but made no impression on the conjunctival surface. The skin was adherent and slightly nodular, but not eroded. There was no tenderness. In the absence of any hæmorrhagic history, the peculiar uniform dark colour suggested malignancy, and immediate excision was advised.

On August 9, under ether, I excised the tumour with a margin of healthy tissue, some points of doubtful character being thoroughly destroyed by the galvano-cautery. Owing to the extensive exposure of the cornea and the consequent danger of keratitis, the deformity was subsequently corrected by a plastic operation which involved some change in the shape of the defect, and its closure by means of a sliding flap from the temple, thus making an entirely new outer half of the eyelid. Healing was prompt and uninterrupted. At the time of his discharge from the hospital two weeks later, the new lid performed its functions perfectly, and except in the absence of lashes, was not noticeably different from its fellow. Eighteen months after operation the conditions remained unchanged; there had been no return, and general health seemed perfect.

On microscopical examination the tumour was found to be a melanotic spindle-celled sarcoma, incompletely encapsuled. The conjunctiva was not involved or distinctly changed, and the muscular tissue of the lid was unaffected. The point of origin remains in doubt, but was probably within the Meibomian glands.

It is not uncommon to have secondary involvement of the eyelids by melanotic growths originating in some neighbouring tissue; this is particularly true of sarcomata of the conjunctiva, which so frequently start at the corneal limbus. Intraocular tumours may also, after perforation, involve all the tissues in and about the orbit. Melanotic sarcoma arising within the substance of the lid, seems, however, to be extremely rare, and I have been able to discover but four recorded cases.

Dr. Edward Jackson has had a case not hitherto rereported, of a small pigmented tumour, long present, which had recently commenced to grow rather rapidly. It had attained the size of a pea, and was situated on the lower eyelid near its free margin. It was excised, and on microscopic examination proved to be a small, round-celled melano-sarcoma. The patient remained under observation for a few months, during which time there was no recurrence.

Argyll Robertson[1] reports a case of round-celled melanotic sarcoma occurring in a child, with early extension to the bulbar conjunctiva. No subsequent history is given.

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[1] *Trans. Med. Chir. Soc., Edinburgh*, N.S. iv., p. 3, 1884-85.

Homer[1] publishes a case of melano-sarcoma arising from the tarsal conjunctiva. The growth, which was the size of a walnut, was excised. There had been no return eight months later.

Helfreich[2] describes a case of pigmented nævus undergoing sarcomatous degeneration. The tumour was small. There had been no recurrence thirteen years later.

Randall's case[3] was one of large spindle-celled sarcoma, containing traces of pigment and entirely encapsuled. Recurrence in three years with incomplete encapsulation.

The diagnosis is not easy, but rapidity of growth and the peculiar dark colour, with no hæmorrhage to account for it, are the main points; only microscopic examination will finally decide. The treatment is that of sarcoma elsewhere—early and complete excision. Operation in this locality presents no peculiar difficulties, and can usually be made thorough. The destruction of suspicious tissue by the cautery, I believe to be important. Primary or secondary plastic operations will usually be required, either for cosmetic reasons, or to preserve the integrity of the cornea.

The prognosis is for sarcoma fairly good, although recurrence is probable. After early and radical removal there is often no return for years. Unfortunately such cases can rarely be kept under observation more than a few months.

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[1] *Klin. Monatsbl. f. Augenh.*, 1871, S. iv.

[2] *Zitzungsb. der Phys.-Med. Gesellsch. zu Würtzburg.*, 1891, p. 100-102.

[3] *Trans. Amer. Oph. Soc.*, 1887, iv., p. 496.

ON THE ETIOLOGY AND THE SURGICAL TREATMENT OF TRACHOMA.

BY DR. F. PIGNATARI, NAPLES.

WHEN bacteriology has shown us the parasitic nature of trachomatous affections, we shall then be better able to judge of their analogy with neoplasms, and especially with those destructive neoplasms which, like tuberculosis and lupus, are due to a specific organism. We shall be able to say exactly what should be attributed to accidental injuries of the mucous membrane, caused by foreign irritating agents, and what to diathesis, scrofulous for example.

Roughly speaking, we find that of the trachomatous cases seen in our daily practice, about 85 per cent. occur in what we may call lymphatic individuals. The general appearance, the glands, scars, eruptions of skin, &c., all indicate different degrees of strumous affection.

The gravest cases are those where there is marked infiltration of the conjunctiva, where the granulations are organised into small tumours, and have invaded the sub-mucous tissues, and even the tarsus. These are almost invariably found in scrofulous or tuberculous subjects.

Simple granulations formed of follicles which are semi-transparent, and, as a rule, situated about the fornix, and the so-called "mixed" granulations, the presence of which is due to inflammatory reaction of the normal tissues, are observed for the most part in robust, healthy persons, altogether free from any debilitating diathesis. In these the real trachomatous nodules are relatively scarce, and the cause of the disease is to be sought in the repeated action of irritating agents, such as smoke, dust, &c., which by slow degrees have undermined the conjunctiva. We are not aware if in the lymphatic diathesis there is any alteration in the composition of the lymph which may render it, so to speak, a cultivated liquid, or whether the alteration is in the blood, which has perhaps lost its power of destroying microbes, but it is certain that there is a defect of nutrition which favours infection.

To the best of my belief, from the point of view of the dependence of trachoma on the lymphatic tendency, it is necessary to distinguish between what we may call ordinary lymphatics—such as those which are met with in all classes of society—and acquired lymphatics, which are merely consequences of damp and vitiated air. There is probably no one who does not at once recognise the fact that among both the well-to-do and poorer classes of society, among those from the country and those from the towns, the occurrence of trachoma and a proneness towards glandular trouble have a very frequent and intimate relation.

I have been much surprised to find that, so far as my experience goes, the presence of diffused granulations is much less common among those living in Paris than among the inhabitants of Naples and London. Of the cases which I have seen in Paris, the large majority were examples of simple or mixed trachoma. There can be no doubt, I think, that this is greatly due to the custom of occupying upper stories in houses built in comparatively broad and airy streets which prevails in Paris, even among the poorer classes, in contradistinction to that in Naples and London, where the people live, for the most part, nearer the ground, indeed, sometimes underground, and in narrow streets and lanes, which are usually far from sanitary. In the latter class, ventilation and light are conspicuous only by their absence, and as a result of the dampness, every kind of fermenting mouldiness vitiates the atmosphere. Among the members of one family, those are more seriously affected by trachoma who live the greater part of their lives indoors, as, for instance, women and children, than, on the other hand, those whose trade or occupation obliges them to pass a large portion of the day in the open air, or in a more healthy locality.

Although all this cannot at present be explained by experimental researches, we are nevertheless forced to acknowledge the greater virulence which the specific element acquires in insanitary localities, as compared with situations where the general conditions of health are more carefully looked to.

A rational therapeutic system based upon principles which clinical researches and experiments have placed entirely beyond criticism, demands an antiseptic local cure, and internal treatment directed towards increasing the organic resistance of the tissues to the inroads of the disease. Local antiseptic treatment, although of great use, is yet not enough. When we remember that by means of disinfectant lotions frequently repeated, and applied when the eye-lids are turned back, it is still hardly possible to destroy the microbes which are found in the fornix and the outer surface of the conjunctiva, and that even a strong solution of nitrate of silver affects only the mucous membrane, and not the submucous tissue, we need not be surprised that ordinary applications are unable to cope with the disease.

It is obvious that we should make more rapid progress towards a reliable treatment if we could directly attack the specific germs in the mucous and sub-mucous tissues where they are situated. Two methods of treatment suggest themselves in order to attain this end. One, the injection under the conjunctiva of a sublimate solution; the other, the application of the thermo-cautery. The disadvantage of the latter method is evident; in an affection which is so widely extended as trachoma generally is, the scars resulting from the use of the cautery form a serious drawback to the employment of a treatment otherwise advantageous. One naturally hesitates before having recourse to a remedy which, although undoubtedly efficacious in destroying the specific germs, yet by virtue of its intensity injures the tissue itself. Our object, of course, is to destroy completely all the diseased granules with the least possible destruction of the healthy parts —in other words, with as little scarring as may be.

We seek the solution of the problem, therefore, in an exclusively local and surgical cure. But local and surgical treatment of trachoma cannot be invariably the same, because in its application we must take into account the different circumstances of each case.

In a large number the trachomatous nodules are widely spread over the conjunctiva, and especially at the attached edge of the tarsus and the fornix, but the submucous tissue is not infiltrated, or only very slightly so. It seems as though in these cases the infective element had lodged itself in the folds in which the conjunctiva is so rich, and had there found conditions peculiarly favourable to its development. Here pressure, applied by means of a special forceps, or in other ways, is of incontestable value. By such means, cases which have resisted prolonged treatment, and `which have indeed lasted for months and years, may be often completely cured in the course of a few weeks. But if the infiltration be deep, if there are granulations which are organised into small tumours, then the most energetic pressure will not rid the conjunctiva of the disease. Among other surgical devices, excision of the fornix has been recently recommended. This is injurious in a certain number of cases, inefficient and useless in others. When the granulations are superficial, even if they be grouped together in large quantities in the fornix, we can easily overcome them by pressure and caustic treatment. Why, therefore, deprive the eye of a large part of the conjunctiva, and probably cause serious contraction? If, on the other hand, the granulations are of an aggravated nature, and the tissues everywhere deeply infiltrated, excision of the fornix must be utterly inadequate. A return to the use of scarification, which was for a long time bitterly, and in my opinion wrongly, opposed, coupled with the application of strong antiseptics, is a step in the right direction. This method is perhaps specially applicable to cases of mixed granulations, where there are marked swellings in the mucous tissue. Here scarification combats effectively the excessive inflammation which accompanies the deposit of diseased material in the mucous membrane; but it is well to note that the cases in which such treatment is of real value are those where the physiological activity of the conjunctiva is not lost, where, in fact, there is a healthy reaction of the mucous membrane to any irritant which may be applied to it. In such cases the local congestion being diminished by scarification, and a part of the diseased matter carried away or destroyed, it follows that the blood circulates more easily, the tissue becomes more healthy, and is, perhaps, in a better position to get rid of the remaining unhealthy material which has accumulated in its midst. Where, however, there is little inflammatory reaction after the application of irritants, the method just described is unsuitable. Scarification under these circumstances would only accelerate the transformation of the mucous membrane and its subjacent parts into a tissue of scars, leading to the same deplorable result to which the disease, if left to itself, would have led in a somewhat longer time.

While speaking on this subject it is worth while to mention that the warm, moist compresses, once so largely employed by the school of Graefe, are very efficacious in promoting and maintaining a certain degree of swelling and purulent activity of the conjunctiva, which it is often desirable to maintain.

There is, perhaps, now-a-days a tendency to treat with too little respect the integrity of the conjunctiva, and to forget that on its secretion depends, in great part, the healthiness and cleanliness of the eye.

A remedy which shall be at once strong enough to destroy the infective material, and yet not so strong as to seriously injure the health of the tissue with which it comes in contact, is the goal at which we aim; but it is obvious that with a malady varying in its conditions and degree as trachoma varies, no one method is ever likely to prove sufficient for all cases. What is good for one type of the disease is not necessarily good for another, and it is probably from an ill-advised attempt to make systems of treatment general that many remedies, valuable in their own way, and in a limited class of cases, have been allowed to fall into discredit and disuse.

W. UHTHOFF (Marburg). The Ocular Complications of Syphilitic Disease of the Central Nervous System. II. (Clinical) Part. *v. Graefe's Arch., xl., i., p.* 43.

(*Continued from page* 163.)

The sensory and motor disturbances in the ocular region which occurred in the author's own series of 100 cases are given in the following table:—

(*a*) Oculo-motorius affected in 34 cases: (1) on both sides in 15 cases; (2) on one side (without crossed hemiplegia) in 15 cases; (3) on one side (with crossed hemiplegia) in 4 cases.

(*b*) Abducens affected in 16 cases: (1) on both sides in 11 cases; (2) on one side (without crossed hemiplegia) in 4 cases; (3) on one side (with crossed hemiplegia) in 1 case.

(*c*) Trochlearis affected in 5 cases: (1) on both sides in 1 case; (2) on one side in 4 cases.

(*d*) Trigeminus affected in 14 cases (always on one side only).

(*a*) *Affections of the Oculo-motor Nerve.*—The third nerve was affected in about one-third of the total number, in about the same proportion therefore as it was found affected in the series of 150 published cases (*v. Graefe's Arch., xxxix., i., p.* 128).

(1) Bi-lateral paralysis of the third nerve is more common in syphilitic than in any other class of intracranial disease (about 15 per cent.). In the author's 15 cases the lesion was probably basal in all (in 11 there was no doubt about it); in 5 autopsies the inter-peduncular space was found to be the focus of the disease; in some cases the lesion had involved the crura cerebri; thus in 6 out of the 15 there was hemiplegia, and in 2 paraplegic symptoms; homonymous hemianopsia was found in 2 cases; in one instance, however, the hemianopsia was caused by softening of one hemisphere, and had no connection with the basal lesion. Temporal hemianopsia occurred twice. The optic nerves or tracts were affected in about half the cases; the sixth nerve in 4, the fourth nerve in 3, the fifth nerve in 1, the facial in 3, and the olfactory nerve in 1 case.

In comparing his results with those found in the series of 150 published cases, the author concludes that symmetrical affections of the third nerve are very often complicated with lesions of the other anterior cranial nerves. In the 37 cases the optic nerve was affected 14 times, the sixth nerve 11 times (5 times on both sides), the fourth nerve 6 times (twice on both sides), the fifth nerve 4 times, the olfactory nerves 3 times symmetrically; the facial nerve was also affected in 9 cases, but only partially, and not from any basal lesion. In only 3 of the author's cases of paralysis of both oculo-motor nerves were there no other symptoms caused by the basal lesion, and in the 22 examples of the double affection from the series of published cases there were also only 3 where the symptoms were so limited.

(2) Unilateral affections of third nerve without crossed hemiplegia. In about three-quarters of these cases the

lesion was a *basal* syphilitic degeneration (1 autopsy); in the 22 cases of the published series also the lesion was, in more than half, found to be in this position.

In the author's 15 cases the optic nerves or tracts were involved 8 times—once homonymous hemianopsia, once partial homonymous hemianopsia, once temporal hemianopsia, once retrobulbar neuritis, 3 times atrophic decoloration.

The sixth nerve was also involved in 5 cases (4 times on one side, once symmetrically), the fourth nerve twice, the fifth twice, the facial nerve twice, and the auditory nerve once. In the 22 cases from the series of 150 published ones, the lesion was also generally basal, for the optic nerves were involved 9 times, the sixth 3 times, the fifth 5 times, the facial 4 times, and the auditory and olfactory nerves once each. Out of all the 37 cases, therefore, there were only 12 in which other cranial nerves besides the third were not involved; in the bilateral affections of the third (also 37 cases) there were only 6. In about half the cases the paralysis was complete. In the 22 cases from the published list the frequency of isolated ptosis (7 cases) is remarkable.

(3) Paresis of third nerve of one side, with crossed hemiplegia. In 3 cases (1 autopsy) the lesion causing both the symptoms must have been a syphilitic basal process involving the apparent origin of the third nerve and the crus cerebri, but in the fourth case (autopsy) there were two lesions, one involving the nerve, and the other—the cause of the hemiplegia—situate in the anterior third of the optic thalamus. In the series of 150 there were 12 such cases, in 11 of them the lesion was in the neighbourhood of the crus cerebri or pons. Of Uhthoft's cases 1 had double optic neuritis. In the 12 published cases the optic nerve was twice involved, the sixth three times, the fourth once, the fifth three times, the olfactory nerve twice (once symmetrically), the auditory twice, and the facial twice.

In the author's 4 cases, in 2 the paralysis of the nerve involved all its branches, as it did also in 6 of the 12 published cases. It is noticeable that in two of these latter no lesion of the third nerve was found to account for its loss of function; in both there were gummata in the convolutions of the motor area.

Analysis of the 90 Cases of Affections of the Third Nerve found in 250 Cases of Cerebral Syphilis.

Branches Affected.	Thirty-seven Cases, Unilateral, without Hemiplegia.	Sixteen Cases, on Both Sides with Crossed Hemiplegia.	Thirty-seven Cases, Bilateral.	Total.
1. All the branches ..	19 cases (14 times basal lesion, twice arterial changes, twice lesion unknown)	8 cases (twice basal lesion, 6 times fascicular)	35 cases. basal lesion in 33 cases, unknown in 2 cases	62
2. Ophthalmoplegia externa	.. ..	3 cases (once basal, twice fascicular)	.. ..	3
3. Ophthalmoplegia interna	2 cases (1 basal, 1 unknown)	.. ..	3 cases (unknown)	5
4. All branches except sphincter pupillæ, but accommodation paralysed	1 case, position of lesion uncertain	.. ..	.. ..	1
5. All branches except levator palpebræ	1 case, position of lesion uncertain	.. ..	.. ..	1
6. Ptosis	8 cases (3 basal, 4 unknown, 1 cortical lesion)	4 cases (3 fascicular, once cortical tumour)	4 cases, all basal lesions	16
7. Levat. palp. rect. inf. and rect. int.	1 case (basal) ..	.. ..	.. ..	1
8. Rect. int., sphincter pupillæ, accommodation	1 case (basal) ..	.. ..	.. ..	1
9. Rect. int. and rect. sup.	.. ..	.. ..	1 case (basal) ..	1
10. Rect. int. and rect. inf.	.. ..	.. ..	1 case (basal) ..	1
11. Levator palp. and internal muscles	3 cases (1 basal, 2 unknown)	.. ..	3 cases (2 basal 1 unknown)	6
12. Rect. int. and internal muscles	1 case (basal) ..	.. ..	.. ..	1
13. Rect. inf. and internal muscles	.. ..	1 case (syphiloma of cortex)	.. ..	1
14. Levator palp. and rect. super.	.. ..	.. ..	2 cases (basal) ..	2
15. Rect. super.	.. ..	.. ..	2 cases (basal) ..	2
16. Levator palp. and rect. intern.	.. ..	.. ..	2 cases (basal) ..	2
17. Partial paresis of 3rd nerve	.. ..	.. ..	4 cases lesion not given	4
18. Anatomical changes at autopsy without disturbance of function	1 case (third nerve grey and discoloured)	.. ..	5 cases basal perineuritic changes	6

(*b*) *Affections of the Sixth Nerve.*—In the author's examples this nerve was affected on both sides in the majority of the cases (2 to 1); in the series of published cases this was not so (1 to 4). In Uhthoff's 16 cases the lesion was basal in 14 (7 autopsies); in 2 cases its position was uncertain; the complications of the other cranial nerves were as follows: optic nerve 9 times; third nerve 6 times; fourth nerve 3 times; fifth nerve twice; auditory nerve once. In the 27 instances of affections of the sixth nerve from the series of published cases there were only 4 uncomplicated by affections of the other cranial nerves; in the author's 16 cases there were only 3.

(*c*) *Affections of the Fourth Nerve.*—This nerve was affected in 5 of the author's cases; in the series of 150 published ones it was affected 6 times only; in all 11 cases there were complications on the part of other cranial nerves; the third nerve was affected in every instance; the optic nerves 8 times, the sixth 3 times, the auditory and facial 5 times each, the fifth 4 times and the olfactory nerve once. In 10 cases the lesion was basal in position, and in one case was a pressure effect caused by tumours in the hemispheres; in no case was it nuclear.

(*d*) *Affections of the Fifth Nerve.*—In all the 14 cases the lesion was probably basal, though in 3 there was some uncertainty as to its position. The complications with other cranial nerves were: optic nerve affected 11 times; third nerve 6 times; sixth nerve 6 times; fourth nerve once; auditory nerve 5 times; olfactory nerve twice; facial nerve 8 times. In only one case was there keratitis neuro-paralytica.

In the 22 cases from the 150 published before there was but one in which the nerves of both sides were affected; the optic nerve was only 9 times affected in these 22 cases, but it is probable that in some of the earlier ones its involvement may have been overlooked; the third nerve was affected in 15 out of the 22 cases, the sixth in 10 cases, the fourth in 4, the olfactory nerve in 2, the auditory nerve also in 2, and the facial in 8. Keratitis neuro-paralytica was present in 6 instances; it is noticeable that there was ptosis in some of these cases previous to the keratitis.

(*e*) *Nystagmus and Twitchings of the Ocular Muscles.*—True nystagmus was only seen in 2 of the author's 100 cases.

It was also noted in 2 only of the 150 collected cases, that is, in 1·6 per cent., whereas in 100 cases of disseminated sclerosis it was found in 12 per cent. (*Arch. f. Psych. u. Nervenkrh.*, Bd. xxi., H. 1 & 2, p. 89). Nystagmus-like twitchings occurred only 6 times in the 100 cases of cerebral syphilis, whereas in disseminated sclerosis they occurred in 46 per cent. of the cases.

(*f*) *Conjugate Deviation of the Eyes.*—This was seen by the author only once; in the 150 collected cases it is mentioned 5 times; in 3 cases the lesion was in a hemisphere and there was paralysis on the opposite side of the body; the deviation on these occasions was towards the lesion, in two the lesion was in the pons, and in these the deviation was away from the side of the lesion.

(*g*) *Pathological Phenomena in the Pupils.*—(1) Pupils acted on convergence but not to light in 10 cases, in 5 cases with no other symptoms in the region supplied by the third nerve, but in one of these anatomical changes in the nerve were found *post-mortem.*

(2) No action of the pupil either to light or on convergence in 4 cases.

(3) *Hemianopic Pupillary Action in one Case*, *i.e.*, the pupil acted less well to light thrown on the blind half of the retina.

(4) *Hippus-like Contraction of one Pupil in one Case.*—The percentages in 1 and 2 contrast markedly with those of tabes (60-90 per cent.) and progressive paralysis (50 per cent.). In only 2 of the cases were any other tabetic symptoms noticed.

It is noticeable that in the author's 100 cases the optic nerves or tracts were affected alone of the cranial nerves 20 times; in 4 cases there was double choked disc, in 8 optic neuritis (6 times double), in 4 homonymous hemianopsia, in 2 temporal hemianopsia, and in 1 atrophic decoloration (Verfärbung); as to the nature of the lesion in these 20 cases, in 11 there were basal syphilitic processes, in 1 arachnitis gummosa of the convexity, and in 8 intracranial disease whose site could not be fixed on. In the 150 collected cases the optic nerves were affected alone 32 times; there was basal syphilis in 12 cases, gummata (not basal) in 9 cases, softening and disease of the vessels in 3 cases, cerebral abscess in 1 case, disease of the cranial bones in 4 cases, and cerebro-spinal lues in 3 cases.

W. G. STORY.

E. VALUDE (Paris). Conjunctivitis with False Membrane and Ocular Diphtheria.

In this article Valude wishes to establish the various clinical types of membranous conjunctivitis. For their pathology he relies on bacteriological research, and such observations can be better understood when the various forms are recognised. The only well-known variety is the so-called pseudo-membranous conjunctivitis, which was described in 1846 by Bouisson, and afterwards by Chassaignac, in contradistinction to which is the true diphtheritic ophthalmia written of by v. Graefe, where there is really no false membrane.

(1) True diphtheritic ophthalmia, or, as he proposes to call it, "interstitial pseudo-membranous conjunctivitis," begins by a stage of infiltration characterised by intense swelling of the lids, which become hard as wood and cannot be everted. The conjunctiva is swollen, of a shining greyish colour, but without any—or with only very little—secretion. In the centre of the infiltration some yellow spots and blood-staining can be observed. No bleeding follows scarification, however deep. In slighter cases, one may notice merely patches of infiltration, and between them the conjunctiva is only injected. The second stage, or that of elimination, is limited to the formation of eschars. The infiltrated parts, in which the circulation is not able to re-establish itself, die, and are thrown off. The whole thickness of the conjunctiva, or only part of it, may be involved in the destruction, and the secretion, which was barely present in the first stage, now becomes abundant as well as purulent. Finally, in the third stage the mischief heals with cicatrices and more or less extensive symble-

pharon. The destruction of the cornea is usually rapid and complete. When the cornea escapes the infiltration is very limited. In severe cases there is danger to life. The patient may succumb to the primary fever, but more often to sequelæ. This affection may occur in infants, but is more usual between the ages of 3 and 8.

(2) *Croupous or pseudo-membranous conjunctivitis.*—This is only an ordinary acute catarrhal ophthalmia, but presents these characteristics: that the conjunctiva bleeds easily, and especially near the palpebral border is covered with an easily detached semi-transparent fibrinous product. Sometimes a complete cast of the mucous membrane and *cul-de-sac* comes away, leaving the mucous membrane beneath red and a little bloody, but not otherwise altered. It follows the course of an acute catarrhal conjunctivitis, lasting fifteen to twenty days, and usually ends well. Corneal accidents are the exception; the chief point to notice is that the false membrane contains none of the layers of the mucous membrane, which recovers without alteration, and if the cornea remains intact, no trace of the malady is left. These, then, are the two well defined forms, but there are two other forms which deserve notice.

(3) *Chronic pseudo-membranous conjunctivitis.*—From the study of reported cases this seems to be rare. Hume reports three cases in which the false membrane persisted for three months with little or no affection of the cornea. They occurred in weakly babies. Arlt reports rather more severe examples of the same sort. Guibert's observations are more interesting, because he made some bacteriological observations, though rather late in the course of the disease. He found chiefly staphylococci, but also a colony of streptococci.

The characteristics of this form seem to be a very tenacious false membrane, persisting for a long time, but without causing loss of vitality of the mucous membrane. The cornea nearly or quite intact, even although the disease may have lasted for some months. It usually attacks weakly children, infants, as well as those 7 or 8 years old. The following are the symptoms.

In the course of a purulent catarrh in which the secretion has lasted longer than usual, an adherent yellowish-grey false membrane, several millimetres in thickness, forms at the bottom of the *cul-de-sac*, and even over the conjunctiva; fragments of this membrane are with difficulty detached with forceps. False membrane may cover the cornea completely; at the same time swelling of the lids is present, and the purulent secretion becomes serous. The peculiar characteristic of this variety is that the false membrane remains in position several weeks and even months, and when it comes away the mucous membrane is found to have perfectly recovered, and the same is true of the cornea. As regards the general symptoms, the children affected have been generally in a very weakly state. The peculiarity of Guibert's case was that the false membrane had formed three times, and that each time the child suffered from sore throat. The mother and two brothers were also attacked with sore throat, but no false membrane developed.

(4) *Acute Pseudo-membranous Conjunctivitis.* — Literature contains no report of such cases, but Valude himself has seen two. He was called in consultation at seven one evening to an infant, 12 days old, who had a slight catarrhal ophthalmia which did not yield to the treatment of nitrate of silver and boracic acid. There seemed to be nothing but slight conjunctivitis. Twelve hours later, however, the lids were enormously swollen, and the conjunctiva was covered with a thick grey membrane, so adherent that it could not be separated with forceps. The cornea had entirely lost transparency; moreover, there seemed to be no possible source of diphtheritic infection. About the twelfth day the false membrane began to detach itself without any very great suppurative reaction; it had completely cleared off by the fifteenth day, leaving the mucous membrane bright red, bleeding easily, but otherwise of normal appearance. The lower part of the cornea sloughed, but the upper part regained its transparency. He reports other cases whose results he has seen and the course of which appears to have resembled

his. A summary of the symptoms of this form is as follows:—In the course of a slight purulent ophthalmia, without any sign of what is going to take place except perhaps some thickened exudation at the bottom of the *cul-de-sac*, suddenly a condition of extreme gravity arises; considerable swelling of the lids takes place, and there is great difficulty in everting them; a yellowish-grey false membrane covers the whole extent of the conjunctiva; this cannot be detached by friction or forceps, and when pieces of it are torn away the mucous membrane bleeds freely. In about twelve hours, according to Valude's experience in his two cases, the cornea becomes grey and softened and rapidly perforates, and in twenty-four to thirty-six hours the eye is lost. In the case mentioned above, however, a third of the cornea was saved, but there was a large perforation. These symptoms rapidly reached their greatest intensity and continued for fifteen days, subsiding slowly, and with some thickened purulent secretion. The false membrane begins to detach itself piecemeal, leaving the mucous membrane beneath bleeding and eroded. A catarrhal condition of the conjunctiva remains, which disappears more or less quickly after the destruction of the cornea. Afterwards some small cicatricial bands and slight symblepharon are usually left, showing that there has been actual destruction of the mucous membrane, and thus differing from the preceding pseudo-membranous varieties where the affection is purely superficial. During the attack there is a slightly febrile condition, and the general health is more or less affected. So far this type has only been observed in infants; whether the same symptoms can manifest themselves in adults is not known.

With regard to the pathology of these various forms of pseudo-membranous conjunctivitis, the question of their being kindred to, or identical with, true diphtheritic ophthalmia had been raised before the days of bacteriology. Some report instances of pseudo-membranous conjunctivitis passing into true diphtheritic ophthalmia. Others have published cases of children with croupous conjunctivitis who have ultimately died of laryngeal croup.

This tends to connect the two forms as originally the same, but producing different results. Others, again, point out the impossibility of so connecting them, but this view is not so easily upheld when we consider the above-mentioned varieties, where there seems to be a state of transition between the two. Recent bacteriological observations help to solve the problem. Guibert, in a case of chronic pseudo-membranous conjunctivitis, found only streptococci and staphylococci, but Sourdille remarks that the bacillus of Löffler could not be determined because of the late period at which the examination was made; indeed, the specific bacillus of diphtheria can be masked by the presence of other microbes, and requires for its discovery repeated examinations. In other cases only pneumococci have been discovered; in others only streptococci. The observations of Moritz and the conclusions of Sourdille point rather to the suggestion that croupous conjunctivitis, as well as the true diphtheritic form, cannot be easily produced by the sole action of streptococci and staphylococci without the influence of the bacillus of Löffler. Moritz, in nearly all his observations, has come across a bacillus morphologically resembling that of diphtheria; he repudiates, however, the idea of true diphtheritic infection, but attributes it rather to a mixed infection with staphylococci and streptococci, resembling that which produces aphthous stomatitis. Sourdille arrives at an analogous conclusion when he admits that the gravity of the infection depends on two factors — the polymicrobic association and the special virulence of the bacillus to which the morphological character of the affection is due. The key to the problem must be sought in microbic association.

It would appear, then, that the slighter forms of pseudo-membranous conjunctivitis depend rather on the association of staphylococci with the bacillus of Löffler, while the union of this bacillus with streptococci gives rise to the graver forms as well as the true diphtheritic form when that is not due to a pure infection of the diphtheritic microbe. Sourdille even maintains that corneal troubles are not caused by corneal ischemia, but are secondary infections due, generally, to streptococci. What has now to be established is in what measure, in what proportion, and in what fashion, these various microbes are associated to produce the different forms, namely—(1) simple or catarrhal pseudo-membranous conjunctivitis; (2) chronic pseudo-membranous conjunctivitis; (3) acute pseudo-membranous conjunctivitis; (4) true diphtheritic ophthalmia or interstitial pseudo-membranous conjunctivitis.

Treatment.—The treatment of all these varieties is much the same, and very different to what should be employed in simple catarrhal or purulent affections. The great point is to avoid doing harm. Nitrate of silver and other caustics, sublimate solutions, iced applications and scarifications must be avoided. Warm fomentations as hot as the hand can bear should be frequently employed. Boracic acid will do for this purpose, but Valude himself prefers the following: extract of opium 10 centigrammes, sterilised water, 1,000 grammes, which can be easily prepared by putting into a litre of boiling water ten drops of a solution composed of sterilised water and glycerine, of each two grammes, with extract of opium one gramme. This is an excellent antiseptic application, which allays pain and diminishes secretion. If there is great swelling of the lids a solution of naphthol can be used instead. Concurrently with these warm fomentations, iodoform ointment may be employed. When, during the elimination of the false membrane, free suppuration occurs, tirpinol mixed with equal parts of vaseline or sweet almond oil may be used as the basis of this ointment. It is difficult to say if lemon juice should be tried, but if so, it should be applied to the false membrane once or twice a day by the surgeon himself. Sourdille advises touching the membrane twice daily with a solution of phenic acid and glycerine, and if there be corneal lesions, instillations every two hours of methyl violet or blue 1 in 1,000. The corneal lesions should themselves be touched with the phenic acid solution.

R. W. Doyne.

F. C. HOTZ (Chicago). The Therapeutic Value of Weak Lenses. *Journal of the American Med. Assoc., Vol. xxii., No.* 13.

Admitting that while formerly, patients with weak eyes have often received unnecessary medicine, they now often receive superfluous spectacles, Hotz yet cannot agree that the line of usefulness should be drawn against glasses of very low degree.

The mere fact that in a large number of cases of eye discomfort low degrees of refractive error are found, proves nothing, since we know that slight departures from emmetropia are so very common in the human eye. And even the mere statement that the patient was relieved is in itself not sufficient evidence of the curative power of these glasses.

But if all local or distant conditions which we know to produce ocular distress independent of refractive errors, are absent, or have been removed without restoring comfort to the eye, if the eyes are used under precisely the same conditions after the glasses have been prescribed as they were used before, or if an irritability of the eyes has resisted all treatment but is speedily relieved by glasses, then, and then only, we are warranted in attributing the relief of the eyes to the correction of the existing slight refractive errors.

Such cases are exceptional, but he has collected from his case book the notes of fifty, in which sphericals of less than 0.75 D., or cylinders of 0.25 D., or sphero-cylindrical combinations of low strength were prescribed. Of the fifty cases treated with weak lenses, thirty patients have reported good results, one patient has reported a negative result, and nineteen have not been heard from. Even if all those not heard from are regarded as failures, the results, successful in 60 per cent. of the cases, are gratifying; and proof is afforded that the therapeutic value of these weak lenses is not mythical, but real.

It must not be forgotten that the eye is most successful in correcting by accommodative efforts the optical disturbances produced by slight degrees of hypermetropia or astigmatism, while in the higher degrees of these refractive errors it does not succeed, and therefore abandons the effort. The moderate degrees, therefore, are the prevailing errors of refraction found in patients complaining of the symptoms of eye strain.

The degree of ametropia does not constitute the principal condition in the production of distressing symptoms ; and experience does not sustain the statement that hypermetropia or astigmatism less than 0.75 D. seldom causes discomfort or headache. The state of health, the condition of the nervous system, the occupation, are very important factors, and frequently account for the fact that in many persons a slight hypermetropia or astigmatism causes great distress, while other persons never experience the slightest discomfort from ametropia the same in kind and degree.

Many eyes can endure a great amount of strain with impunity, while other eyes are so constituted that their powers of endurance are quickly exhausted. One person may need glasses for the correction of a small amount of ametropia, while in another the correction of a much higher degree is unnecessary, and glasses would be superfluous. We cannot draw the line at a certain amount of ametropia, but should correct it, no matter how slight in degree, whenever it leads to disturbances for which eye strain constitutes the most frequent cause.

E. J.

A. SCHAPRINGER (New York). The Proximate Cause of the Transient Form of Myopia associated with Iritis. *New York Medical Journal, Oct.* 21, 1893.

The clinical fact of certain refractive changes occurring during and after iritis, first reported by Green, of St. Louis, is now well established by the testimony of many observers. The changes in question are in the direction of myopia, coming on during the attack and diminishing afterwards. The eye may be less hyperopic after the iritis than before, or it may be at first myopic and pass back again into hyperopia.

Schapringer, reviewing the explanations of the phenomena thus far put forward—including infiltration of the vitreous and pushing forward of the lens, augmentation of the corneal curvature, and spasmodic action of the ciliary muscle—regards them as all insufficient, and suggests that such transient myopia may be best explained as due to a temporary increase of the refractive index of the aqueous humour.

That the composition of the contents of the anterior chamber in iritis differs from that in the normal state is not a hypothesis, but a fact. The formed particles suspended in the aqueous humour, rendering its aspect turbid, will, of course, have no influence upon the refraction of the eye. We are here concerned only about the transparent part of the liquid. Judging from the deposits, among other substances, of fibrin from the walls of the anterior chamber, nothing would seem more plausible than to assume that in iritis the aqueous humour contains this substance in more than the normal quantity. If this is the case, it follows from physical laws that its index of refraction must be increased.

A higher index of refraction of the aqueous will produce myopia, because the beams of light which receive an inclination toward the optical axis, when refracted at the anterior corneal surface will receive an additional inclination towards this axis at the posterior corneal surface.

In the normal state there is no refraction at this surface, because there is no difference between the refractive indices of the cornea and of the aqueous humour. The posterior wall of the cornea in iritis represents a convex refracting surface with a medium of higher refrangibility behind it than before. Consequently the optical conditions present at this surface will be the same in kind, though not in degree, as those present at the anterior surface.

Taking the standard formulæ for the index of a refractive system, Schapringer calculates that to produce in an emetropic eye the following degrees of myopia would require the index of refraction shown in the corresponding position in the second column :—

Degree of Myopia.	Index of Refraction of Aqueous.
1. D	1.345
1.5 D	1.349
2. D	1.353

The increase from the normal, which is 1.336, is not so considerable as to speak against the plausibility of such an hypothesis.

[The suggestion of refractive changes occurring in this way in the eye is an important one, but in working the matter out, Schapringer does not seem to have taken into account the diminution of refraction that would take place at the anterior surface of the lens by reason of such a change in the aqueous, and they would render necessary a much greater change of refractive index to produce the degrees of myopia indicated.] E. J.

THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 14, 1894.

GEORGE LAWSON, F.R.C.S., Vice-President, in the Chair.

Optic Neuritis in its Relation to Cerebral Tumour and Trephining.—Dr. James Taylor read this paper. He alluded to the fact to which Horsley had some time ago called attention—namely, the subsidence of optic neuritis after operation undertaken with a view to the removal of cerebral tumour, even when the tumour was not removed. Similar observations had been recorded by Bruns and Erb, and in this paper it was intended to emphasise the fact that not only in cases in which a tumour was removed from the brain did the optic neuritis subside and the discs resume a normal appearance, but even in other cases of tumour in which the skull was opened, but the tumour not removed or interfered with further, a similar subsidence of the swelling of the discs took place. Three cases of optic neuritis associated with intracranial tumour were first described, in which the tumour was removed and the optic neuritis subsided. Another group of three cases was next detailed. In all of these there were the usual symptoms of intracranial tumour. All were trephined, and in two of them the tumour could be seen at the operation, but was not removed or even incised. Yet the neuritis in one entirely disappeared, although the patient subsequently died, and tumour was present; in the second the swelling had diminished by one millimetre, although the tumour, as was apparent from the symptoms, continued to grow, and the patient died soon after passing from observation. In the third case of this group the symptoms pointed to cerebellar growth, probably tubercular, but no tumour could be found at the operation. But the swelling of the discs which was present disappeared, although slight impairment of vision remained in one eye. A third group of cases was next described, also consisting of three. The first was that of a patient from whom a cerebral tumour was removed, and the neuritis, which was present in only one eye, disappeared. He subsequently died, and a cyst was discovered occupying the site of the tumour which had been removed. There was no recurrence of the neuritis when he was last seen, three weeks before his death. The second case was that of a boy, who was trephined on account of right-sided fits and weakness. Optic neuritis was present. A cyst was tapped, and a drainage tube kept in intermittently during two years. Finally, large masses of tumour were removed, but the boy died later, and sarcomatous masses were found *post-mortem* in the brain. The neuritis subsided after the first trephining and drainage, and never recurred during the subsequent two years, although there was little doubt that the original cyst tapped was a cyst in the tumour. The last case was that of a man at present in hospital, from whose brain a sarcoma was removed. The optic neuritis which was present disappeared, and had never recurred, although at a later operation, undertaken on account of symptoms of recurrence of the tumour, it was found impossible to remove the growth. It was urged, in conclusion, that, even while freely admitting that a large cerebral tumour might be present without producing optic neuritis, and that optic neuritis might be present without cerebral tumour, as was long ago pointed out by Dr. Hughlings Jackson and Dr. Gowers, such facts and observations as were related in this paper made it evident that in certain cases, at least, of intracranial tumour the pressure inside the skull was the effective agent in producing what was known as optic neuritis.

Dr. Hughlings Jackson considered Dr. James Taylor's paper to be an exceedingly valuable contribution both to ophthalmology and neurology. Mr. Horsley had certainly shown that raised intracranial pressure was a most important factor in the production of optic neuritis in some cases of intracranial tumours. Dr. Jackson had, however, found double optic neuritis both in cases of small and of large intracranial tumours. Optic neuritis might be absent in cases of large cerebral tumours which had existed for several years. Again, double optic neuritis was sometimes found in cases of brain disease in which there was no tumour or any other kind of adventitious product within the cranium, and no renal disease. Cases of uniocular optic neuritis had to be considered; he had seen but three cases with necropsies, and in them the tumour was of the opposite cerebral hemisphere. These cases were difficult of interpretation on any hypothesis. He then referred to rapid death in some cases of patients who had double optic neuritis from intracranial tumour. In some of them death occurred by failure of respiration (a mode of dying in these cases first pointed out by the late Hilton Fagge). When the tumour was cerebellar the failure of the respiratory (medulla) centre might easily be attributed to transmitted pressure. Dr. Jackson mentioned the case of a patient, the subject of optic neuritis, who died by respiratory failure where the tumour was of one occipital lobe. The patient became fatally ill when at work at the docks. Dr. Jackson referred to an important paper by Mr. Horsley and Mr. Walter Spencer[1] dealing experimentally with the general question of raised intracranial pressure. Dr. Buzzard had put forward the hypothesis that rapid death in some cases of intracranial tumour with optic neuritis might be due to changes in the vagus nerves, changes analogous to those of optic neuritis. Possibly, Dr. Jackson thought, in the cases of death by failure of respiration, there was induction of such changes in the respiratory centre.

Mr. Victor Horsley thought that the removal of pressure was certainly one factor in the reduction of optic neuritis in cerebral tumour, but only one of several. It was enough to remove the bony covering in many cases to reduce the pressure and remove the optic neuritis, but pressure was not enough to explain all cases of optic neuritis, such as occurred, for instance, in anæmia. From his experience, the operation was only good in removing neuritis; it was useless in removing any atrophy which might have supervened. When a tumour recurred after removal there was no recurrence of optic neuritis; this put out of court the inflammatory explanation of the neuritis.

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[1] *Trans. Royal Soc.*, B., 1892.

Mr. Ballance did not agree that pressure was the essential factor in producing optic neuritis. Around every foreign body or tumour there was an area of inflammation larger or smaller according to the disturbance exerted by it on the tissues around, and he thought that the inflammatory theory of optic neuritis, as supported by the observations of Messrs. Edmunds and Lawford, should not be rejected without a microscopic examination of the meninges for basal meningitis.

Dr. Beevor had lately seen one of the cases in which the tumour was removed. There was no recurrence of the optic neuritis, and the headache was less.

Dr. Hill Griffiths thought that the complete recovery after sudden attacks of blindness with optic neuritis could only be explained on the pressure theory, as the vision was absolutely unimpaired after recovery.

Some Points in the Histology of Trachoma.—Mr. N. C. Ridley read this paper. Specimens of conjunctiva had been obtained from cases of trachoma, follicular conjunctivitis, and from normal eyes. In the normal conjunctiva the epithelium on the globe and lids were stratified. and in the fornices consisted of two or three rows of columnar cells, with goblet cells; there was a variable amount of lymphoid tissue in the subconjunctival layer. This lymphoid tissue, called sentinel tissue by physiologists, was found beneath all mucous membranes; it increased in amount when more work was thrown on it, and was evidence of the reaction of the organism to the attacks of deleterious agents. In trachoma this increase took the form of rounded elevations covered by delicate epithelium, and without a fibrous investment as had been described by some authors. These follicles were to be considered infective granulomata, but contained healthy blood vessels and no giant cells. There was probably a specific cause of trachoma; many kinds of micro-organism had been described, but none had satisfied inoculation tests. The changes began in the fornices with the proliferation of cells, formation of crypts, increase of goblet cells, and the formation of ovoid bodies; in a late stage the epithelium was shed. The globular bodies, described by Reid and Mütermilch, were probably not goblet cells; they resembled the oval bodies of molluscum contagiosum, which were supposed to be parasitic.

Osteoma of Orbit.—Mr. Simeon Snell (Sheffield) narrated this case. The patient was a married woman, aged 25. The history dated back at least four years, recurring suppurations pointing above the left upper eyelid. When seen in September, 1890, there was a swelling in the situation of the frontal sinus, and the eye was somewhat displaced downwards and outwards. In situation and appearance it resembled a distended frontal sinus; patient at times suffered great pain. The left nostril was plugged by a hard osteoma. On October 14, 1890, the growth was removed; it was about the size of a pigeon's egg. On the supposition that a distended frontal sinus had to be dealt with, an incision was made at the inner angle below the orbital ridge, and whilst chipping away some bone from this region, the bony mass was found to be detached, and was readily removed by forceps. It was irregular and undulated, of bony hardness; but at the part by which it had been attached it consisted of thin spongy substance. A large roughened cavity was left, which corresponded to the inner wall of the orbit, and to the situation of the ethmoidal sinuses and the back part of the frontal sinus.

Congenital Serous Cysts of the Eyelids, associated with Anophthalmos or Microphthalmos.—This paper was read by Mr. Simeon Snell. Five cases had come under his observation; they had all been seen in early infancy. Two of those, now related, involved the lower eyelid—one the right, the other the left; one was situated in the left upper eyelid, and Mr. Snell remarked on this as being peculiar: most, if not all, on record being in the lower eyelid. They all gave a bluish appearance to the part affected, and were associated in two with anophthalmos, and in one with microphthalmos. Mr. Snell thought if the orbit was carefully searched, a rudimentary eye would often be found. He said that in the diagnosis of these cysts the chief affection from which they should be distinguished, was meningocele. Before proceeding to dissect out the cyst, if this was thought necessary, it was well to tap and draw off some of the fluid for examination.

Card Specimens.—The following card specimens were shown:—Mr. Mackinlay: Congenital Symmetrical Dislocation of both Lenses, upwards and inwards, in a brother and sister, not twins.—Mr. Juler: Peculiar Symmetrical Changes in the Choroids in a case of High Myopia.—Mr. Holmes Spicer: A Case of Retinitis Circinata.[1]—Dr. Sydney Stephenson: A Case of Coloboma of the Lens (double).—Mr. H. Work Dodd: A case of Binocular Polycoria.—Dr. Beevor and Mr. Lang: A Case of Binasal Hemianopia.

Case of Retinitis Circinata.—This case was shown by Mr. Holmes Spicer; it had been under his observation since March of this year. The patient was a woman aged 73, whose sight had been steadily failing for about four years; she was free from rheumatism, gout or kidney disease, and there was nothing abnormal in the condition of her vascular system.

In the right eye there were many small flame-shaped hæmorrhages chiefly in the course of the upper temporal vein; there were no white patches anywhere.

In the left eye the optic disc and vessels were normal; the retina in the macular region was opaque, grey, and its details blurred. Around the macular region there was an incomplete zone of white spots of different sizes, arranged in the form of an ellipse with the long axis horizontal; the spots varied in size from the diameter of a retinal vessel to about three times the diameter of the optic disc; the larger white areas seemed to be made up of a number of confluent dots. The largest area was roughly crescentic in shape, and was situated to the temporal side of the optic disc, its surface covered with a more or less regular arrangement of dark red dots, giving the whole patch much the appearance of a section of bone with Haversian canals. The retinal vessels were entirely superficial to the white areas.

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[1] We think it worth while to add below, detailed notes of this example of a rare disease. [Ed.]

The case belongs to the group first described by Fuchs (*v. Graefe's Archiv.*, xxxix., 3, 229[1]), and was thought by him to be a fibrinous exudation in to the retina, but de Wecker has since maintained that retinitis circinata is only a form of retinitis hæmorrhagica. In this case, in spite of the abundant hæmorrhages in the other eye, no hæmorrhages were seen in this eye, and no retinitis circinata in the eye in which there were hæmorrhages.

CORRESPONDENCE.

"CHILDREN'S EYESIGHT."

TO THE EDITORS OF THE "OPHTHALMIC REVIEW."

SIRS,—An error occurs in your report of my remarks at the May meeting of the Ophthalmological Society in the OPHTHALMIC REVIEW of that month. I did not speak of the difficulty of obtaining examinations in schools owing to the want of appreciation on the part of the teachers, but on the other hand, I referred to the increasing interest which teachers displayed, in my experience, in the question of the children's eyesight.

I shall be obliged if you will kindly insert this correction.

I am, Sirs,
Yours faithfully,
SIMEON SNELL.

Sheffield, May 21, 1894.

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[1] For an abstract of this paper see OPHTHALMIC REVIEW, vol. xii., p. 337.

ON AN INSTANCE OF HEREDITARY GLAUCOMA AND ITS CAUSE.

By PRIESTLEY SMITH.

OPHTHALMIC SURGEON, QUEEN'S HOSPITAL, AND LECTURER ON OPHTHALMOLOGY, MASON COLLEGE, BIRMINGHAM.

IT is well known that the liability to primary glaucoma is sometimes hereditary. For example, in the "Graefe-Saemisch Handbook,"[1] references may be found to the occurrence of the disease in a mother and two daughters, in a father and three sons, in a mother and three sons, and in other instances. An observation of the same kind, relating to a father and to two, if not three, sons, has been recorded by Mules in the pages of this journal.[2] Examples still more striking were noted by von Graefe; he speaks of certain families in Berlin, in which the disease had appeared in three or four generations in succession.[3] Harlan met with a similar family history in Philadelphia.[4] But though this disastrous form of heredity has been recognised as a fact for many years, the explanation of it, that is to say, the actual nature of the transmitted peculiarity, still remains unknown. Various more or less plausible suggestions, such as the inheritance of gout, of vascular disease, of irritability of the secretory nerves, or of rigidity of the

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[1] "Graefe-Saemisch Handbook," vol. v., p. 65.

[2] OPHTHALMIC REVIEW, vol. ii., p. 49.

[3] *Von. Graefe's Archiv.*, vol. xv., part iii., p. 228.

[4] *Journal of American Med. Assoc.*, vol. v., p. 285; and *Michel's Jahresbericht* for 1885, p. 295.

Ophthal. Review, Vol. XIII., No. 153, July, 1894.

sclera, have been put forward, but they have not been supported by any closely observed facts. In the instance which I have to record, which is the only one I have been able to investigate, the inheritance was of quite another kind ; the hereditary glaucoma depended on hereditary smallness of the eyes.

The glaucoma occurred in a father and daughter, and in the case of the latter I had an unusually favourable opportunity of studying its nature and causation. The father, since deceased, came under my notice seven years ago; he was then already blind from glaucoma in both eyes, but I fortunately kept notes of his case, including the diameter of the cornea in each eye. The daughter came under treatment for advanced glaucoma in one eye quite recently, and, only three weeks before I saw her, had had the other eye removed for absolute glaucoma, at a distance from Birmingham. Very fortunately the excised eye had been preserved in Müller's fluid, and was kindly placed at my disposal.

Case of the Father.—Jabez B., aged 52, was brought to the Queen's Hospital, January 4, 1887 (Q. 4).

Right Eye.—Primary glaucoma, absolute ; V. = 0 ; hypermetropia about 2.5 D. ; horizontal diameter of cornea 10.5 mm. ; T.—1. The history showed gradual failure of vision in this eye for twelve months, and then severe acute symptoms for seven weeks with blindness. A surgeon had made a vertical incision through the corneo-scleral junction at its lowest part five weeks before I saw the patient. This had relieved the pain, and resulted in minus tension with incarceration of the iris in the wound and some ciliary injection.

Left Eye.—Primary glaucoma, absolute ; V. = 0 ; refraction cannot be determined ; horizontal diameter of cornea 10.5 mm. ; T. + 3. History of acute glaucoma 10 years previously, resulting in blindness.

Case of the Daughter.—Cecily B., aged 29, was brought to the Queen's Hospital, March 13, 1894 (W. 106).

Right Eye.—Excised three weeks ago for absolute glaucoma. Description of specimen given later. The history showed that this eye was attacked by acute or sub-acute glaucoma, preceded by rainbows, in May, 1893; by October, 1893, it was blind; in January, 1894, pain and redness recurred; in February, 1894, it was excised.

Left Eye.—Primary glaucoma, chronic; hypermetropia about + 6. D.; T. + 2; media clear; disc cupped; V. = perception of hand movements *inwards* from fixation point; horizontal diameter of cornea 10 mm.; history of failing vision in this eye for three months, with very little redness or pain.

In spite of the extreme impairment of vision, there appeared to be a chance of preventing total blindness; operation was therefore advised, and carried out two days later. On the day of the operation the following point was noted: Examined at the moment of waking from the night's sleep, the eye presented a small pupil and T. normal or + 1; five minutes later, the patient being thoroughly awake, the pupil was larger and T. considerably higher.

Operation on Left Eye, March 15.—Cocaine; no general anæsthetic. Puncture of the sclera with a Graefe knife about 5 mm. from the outer margin of the cornea; some escape of clear fluid, and consequent slackening of the globe; upward iridectomy with a very narrow Graefe knife, the incision well in the sclera. The anterior chamber appeared completely empty at the close of the operation, and remained so during the two following days; on the third day after operation it was re-established permanently. The tension appeared to be about normal at the close of the operation; it remained about normal before and after the restoration of the anterior chamber.

Result, April 3.—Refraction being corrected by glass of + 5.0 D., with + 6.0 cyl., axis nearly horizontal,

12 10 20
V. = $\frac{6}{24}$ partly ; field very small, thus—20 L. 15
25 20 16.

Tension normal. Conjunctiva slightly œdematous over iridectomy scar, and slightly so over scleral puncture.

Re-examined, May 8.—Conditions unchanged.

Report by letter, June 21.—" Since I saw you last, I can see a little better."

The unexpectedly great improvement in the acuteness of central vision, which followed the operation, suggested the idea that the previous extreme impairment might have been partly of the neurasthenic kind rather than solely dependent on the glaucoma. The form of the field after recovery, moreover, and the appearance and manner of the patient were favourable to this idea, but I could get no distinct evidence. The unquestionable result of the operation was a decided and apparently lasting reduction of tension, and together with this a well-marked improvement of vision.

The excised eye proved to be of exceptionally small size. The cornea, like that of the fellow eye, measured 10 mm. horizontally and 10 mm. vertically. The globe measured 22 mm. horizontally, 21 mm. vertically, and 21·75 mm. from pole to pole. After the usual preparation it was frozen and bisected in the horizontal plane, and from the one hemisphere was cut the ring section from which the drawing reproduced here (fig. 1) was made. The method which I employed in making this drawing is more trustworthy, I think, than the use of the camera lucida or prism. It is this : The specimen lies in chloral solution in a glass jar, a thin glass plate etched in millimetre squares is laid upon it, the etched surface being in contact with the surface of the specimen ; the jar is placed under the microscope, and the observer, using a sheet of paper divided into larger squares, plots out the drawing square by square, using a higher or a lower power of the microscope at pleasure for different parts of the specimen according to their intricacy. This method permits of great accuracy as regards the larger dimensions of the specimen ; and it has this advantage over photography, that the draughtsman can distinguish the essential outlines of the section from those which are adventitious or lie in a lower plane, which the camera cannot. The drawing may be made to any desired scale of enlargement. The two drawings here reproduced were made with an enlargement of nearly ten diameters ; they are here reduced by photo-zincography to four diameters.

The points of chief importance in the specimen are visible in the drawing (fig. 1), namely, the subnormal dimensions of the cornea and globe; the relatively large size of the lens ; and the closure of the filtration angle. The anterior chamber was shallower in the frozen globe immediately after its bisection than it appears in the drawing, and was filled with a slightly coagulated serous effusion. A similar coagulum lay between the cords of the suspensory ligament, and coated the septa of the vitreous in the neighbourhood of the ciliary body, rendering them more visible than in a normal eye. The closure of the filtration angle was complete, but there was no firm adhesion, the iris-base separating readily from the opposing surface in the thinner sections. The optic disc presented a deep excavation of the lamina cribrosa ; the nerve-fibres were excavated to a much smaller extent. The excavation is not fully visible in the drawing because the section did not pass through the middle of the nerve.

The significance of the two cases recorded here will be obvious to those who recognise the relationship which exists between smallness of the eye and a liability to primary glaucoma. This relationship has been established by measurements of a large number of healthy and glaucomatous eyes. A full account of the matter

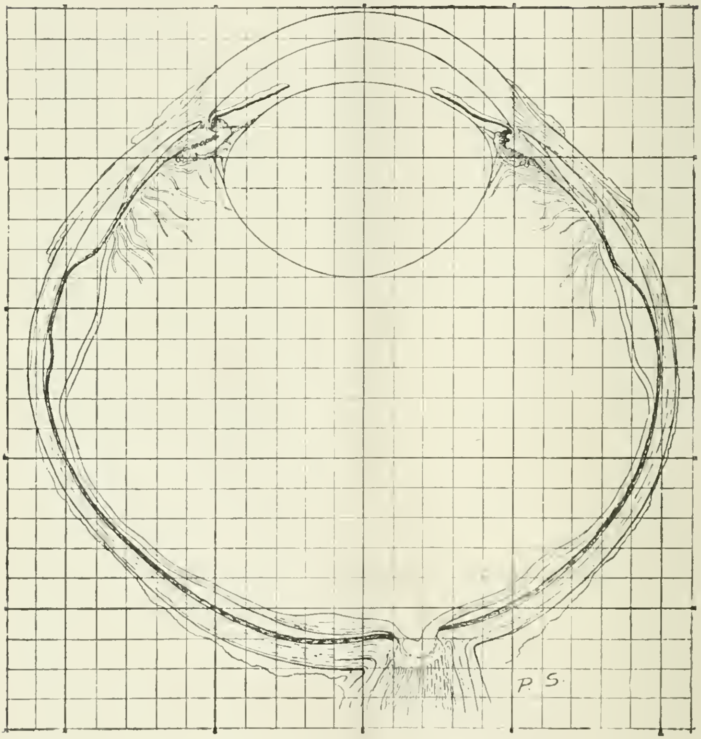

FIG. 1.—Drawn from a horizontal section of the eye of C. B——; blinded by hereditary primary glaucoma. Age of patient 29.
The divisions represent millimetres.

has been published elsewhere,[1] and it will be sufficient here to recall the following points :—

Small eyes are especially liable to primary glaucoma.

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[1] *Trans. of Ophthal. Soc. of United King.*, vol. x., p. 68; and Author's Erasmus Wilson Lectures on Glaucoma." London, Churchill, 1891, p. 96.

They are not by any means the only eyes which suffer in this way, for the disease is often met with in eyes of average and even more than average size, but they suffer with

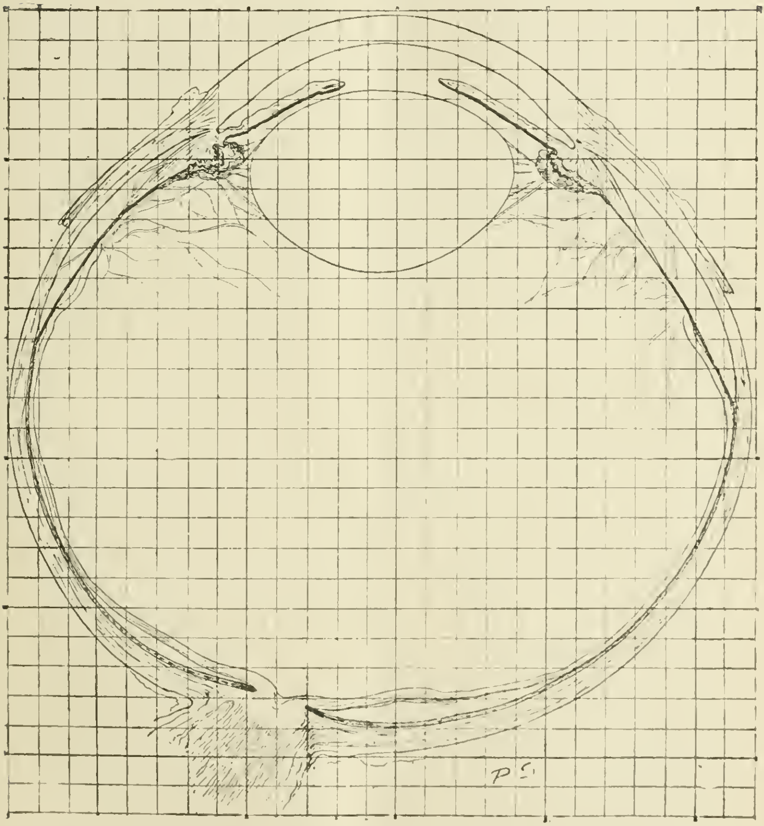

FIG. 2.—Drawn from a horizontal section of a healthy emmetropic eye, removed, together with an orbital tumour, during life, from a man aged 35.

The divisions represent millimetres.

a frequency which is out of proportion to their number. They may be recognised during life by the small size of the cornea. In a very large majority of healthy eyes, namely, in about 95 per cent., the horizontal diameter of the cornea measures from 11 mm. to 12 mm., the average measurement being 11.6 mm. Eyes in which it measures only 10.5 mm. are comparatively rare, and have a special predisposition to primary glaucoma, while eyes in which it measures only 10 mm. have a still stronger predisposition, and appear, indeed, seldom to escape the disease; fortunately they are rarer still. These data, be it observed, relate to English people, and must not be unreservedly applied to other races, but the special liability of small eyes has been noted in other countries as well as in England. Brugsch-Bey, of Cairo, found the average diameter of the cornea to be smaller in eyes suffering from primary glaucoma than in healthy eyes, and he quotes Professor Rampoldi as having observed glaucoma more frequently in small than in large eyes in Italy.[1]

The two cases here related exhibit smallness of the eyes as a hereditary condition, attended both in the father and in the daughter by the disastrous tendency which belongs to it. In the case of the daughter we can trace the causation of the glaucoma a step further. Her excised eye exhibits the want of due proportion between lens and globe which appears to be usual in very small eyes, and which explains their proneness to glaucoma. The lens is too large for the eye which contains it. This is at once apparent when the drawing is compared with that of a full-sized, healthy emmetropic eye (fig. 2), which belonged to a person of nearly the same age. The measurement of the two specimens in millemetres may be here compared :—

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[1] *Trans. of Internat. Med. Congress, Washington*, vol. iii, p. 752.

	Globe.			Cornea.		Lens.	
	Horiz.	Vert.	Ant. Post.	Horiz.	Vert.	Horiz.	Ant. Post.
Glaucomatous Eye	22.	21.	21.75	10.	10.	9.	6.5
Healthy Eye ...	25.	24.	25.	12.	11.5	8.75	6.

It is remarkable that in two eyes differing so much in size, especially as regards the cornea and ciliary structures, the lenses should be almost alike in their dimensions, that of the smaller eye being actually somewhat the larger of the two; but it is certainly not a matter of mere chance, for according to several published descriptions of cases of microphthalmos, it appears to be the rule, rather than the exception, for very small eyes to contain lenses of disproportionately large size.[1] Evidently the growth of the lens is not much influenced or controlled by variations of size in the surrounding parts, and this is not surprising, as I have elsewhere pointed out, when we remember its life history.

The lens originates in the ectoderm of the embryo. It severs its connection with the parent membrane early, and remains an isolated mass of modified epithelial cells which, unlike those in any other part of the body, proliferate within a closed capsule and have no free surface. Before the end of fœtal life it loses all direct vascular connection with the rest of the eye, and is freed, apparently, from all extrinsic resistance to its growth except such as may depend on the hydrostatic pressure of the fluid which surrounds it, and the traction of the suspensory ligament. Being thus unique in its structure and relations, it is unique also in its growth; it enlarges continuously throughout life.[1] On the other hand, the structures which determine the size and contour of the eye—the cornea and sclera—originate, together with the vitreous, and the vascular layers of the choroid, ciliary body, and iris, in the mesoderm of the embryo. In point of time they make their appearance later, and complete their growth very much earlier than the lens. The transparent cornea has, on the average, as large a diameter in the child of five years as in the adult, and the growth of the sclera is probably completed with that of the body as a whole. It is, therefore, not surprising that an imperfect development of the cornea and sclera should have little influence on the development of the lens ; in other words, that in cases of microphthalmos the lens should be found, as it usually is found, too large for the eye.

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[1] Hocquard and Masson, *Archiv. d'Ophtalmologie*, 1883, p. 231; Lang and Treacher Collins, "R.L.O.H. Reports," vol. xii., p. 292; and Kundrat, "Uber die angeborenen Cysten, Mikrophthalmie, &c.," Vienna, Bergmann.

I have shown in previous papers, already referred to, how the continuous enlargement of the lens alters its relations to the parts which surround it, and gradually renders the filtration angle more liable to compression as life advances. In this unfortunate young woman, by reason of the inherited mal-development of her eyes, the lens had already come into closer relation with the filtration angle in early adult life than is usual in normal eyes even in extreme old age. I will not again discuss the steps of the glaucoma-process in detail, but will merely point to the drawing and ask the reader to imagine the lens to lie considerably nearer to the cornea than he now sees it, as it did in the frozen eye immediately after it was bisected.

It is too soon to speak positively, but when a sufficient number of cases has been collected, I think it will be found that this case illustrates a general principle relating to age, namely, that very small eyes are not only more liable than others to primary glaucoma, but are attacked earlier in life. Since attention was drawn to the point, several cases of primary glaucoma in young people with small eyes have been put on record.[1]

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[1] *Trans. of Ophthal. Soc. of United Kingdom*, vol. iii., p. 79.

Whether the cause discovered in the present instance is the usual cause of hereditary glaucoma remains, of course, an open question for the present. It is to be hoped that those who have the opportunity of investigating such cases will do so from this point of view, among others. Meanwhile, it is interesting to note that, according to von Graefe's observations, and according to the various records referred to at the beginning of this paper, the hereditary form of primary glaucoma commonly declares itself, as it did in this case, at a relatively early age.

In some of my earlier writings on the pathology of glaucoma I have, perhaps, dwelt too exclusively on the influence of a large lens; at any rate, some critics have attributed to me a far more exclusive doctrine in this matter than I hold. The causes of glaucoma in general are, in my opinion, extremely numerous, and include such widely different agents as rheumatism, gout, syphilis, anæmia, and many other constitutional diseases; injuries of various kinds; cardiac, vascular, and nervous disorders; neoplasms; congenital malformations; and senile changes. The primary no less than the secondary forms of the disease spring from various and complex causes, including many of those just mentioned. Primary glaucoma seems to depend sometimes chiefly on systemic, vascular, or nerve disturbances, sometimes chiefly on individual peculiarity in the build of the eye, and often on a complex co-operation of several causes. It is not surprising that the structural causes on which I have laid special stress, or indeed, that the whole of the so-called retention-theory should be still set aside in some important text-books as purely speculative; for the most acute observer studying the matter only from the clinical point of view, sees nothing of the normal filtration process, and little of the characteristic changes which disturb it. Moreover, the subject is much too complicated to be cleared up by the examination of a few morbid specimens. It covers a large field of observation, and demands of anyone who would investigate it thoroughly a very prolonged inquiry in the laboratory as well as in the consulting room.

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[1] Spencer Watson, *Trans. of Ophthal. Soc. of United Kingdom*, vol. x., p. 136; W. A. Brailey, the same, p. 139, and W. Lang, the same, p. 107.

In connection with the present case and others like it, an important practical question arises: Can an iridectomy permanently arrest primary glaucoma in a young eye? The result of the operation, so far, in the present case, is a satisfactory filtration scar, with a high degree of astigmatism which was not present before the operation, and which depends on flattening of the cornea in the vertical meridian. It is reasonable to suppose that this change of shape has increased the distance between Schlemm's canal and the margin of the lens in the region of the coloboma,[1] and that, although the lens will presumably still enlarge as life advances, filtration may go on at this part of the circle for many years to come. Obviously, however, the prognosis in such a case must be very uncertain. As to the value of a scleral puncture as an adjunct to an iridectomy, I have now a favourable experience extending over several years. I propose to deal with that subject in another communication.

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[1] Snellen, OPHTHALMIC REVIEW, vol. x., p. 48.

THE INCLINOMETER IN OPHTHALMOLOGY.

By Arthur E. Prince, M.D., Springfield, Illinois.

In the absence of a convenient instrument to determine inclination, one is likely to disregard such measurements, the observation of which might be a source of value.

An attempt to supply the apparent want has been called for by the demands of retinoscopy.

In the January number of the *Annals of Ophthalmology*, I published an "axis indicator," which served to suggest the instrument here offered under the name "inclinometer."

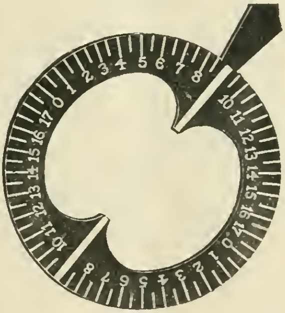

Fig. 1.

The instrument consists of a thin circular metal plate, 1 mm. in thickness, and 37 mm. in width, with a central aperture. The periphery is so graduated that the superior or zenith point will indicate every possible inclination of the diameter, the situation of which is shown by a strong white line which may be readily seen. The two sides, as shown in the cuts (fig. 1 and fig. 2), are graduated respectively to indicate the inclination of the diameter from the horizontal and vertical lines;

the former for determining the axes in astigmatism, and the latter for such purposes as require the zero point to be in the vertical plane. With the average observer the inclination of the diameter is readily determined to within five degrees. Greater accuracy is attained by making the instrument large, and suspending a plumb from the centre of the diameter, as shown in fig. 3.

PURPOSES.

Objective.—(1) In the practice of retinoscopy the inclinometer is rotated in the trial cell until the diameter is seen to correspond with the inclination of the shadow, the degree of which (when the head is held upright) is to be found at the zenith point of the instrument.

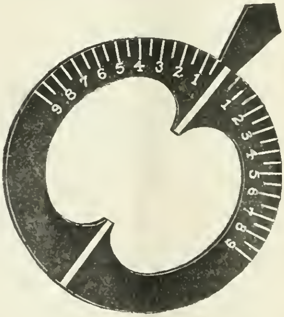

FIG. 2.

Accuracy is facilitated by employing a small source of illumination, best furnished by a 1 cm. aperture in a screen surrounding a Wellsbach gas burner. The light is placed close to and to the left of the observer, and reflected by means of a small plane mirror (Thorington's preferred) into the eye of the patient who sits one metre removed.

(2) The instrument is found to be convenient for

determining the inclination of the axis of a trial cylinder, which may thereby be accomplished independently of the graduations of the trial frame. By this means errors are avoided which arise from imperfections of the frame or malposition of the frame before the eyes.

(3) In the same manner the inclination of the axis of a mounted cylinder may be readily determined.

(4) The facial angle, inclination of the bridge of the nose, inclination of a lens before the eye, and the elevation of one eye above the other, may be obtained by noting the corresponding positions of the diameter of the inclinometer.

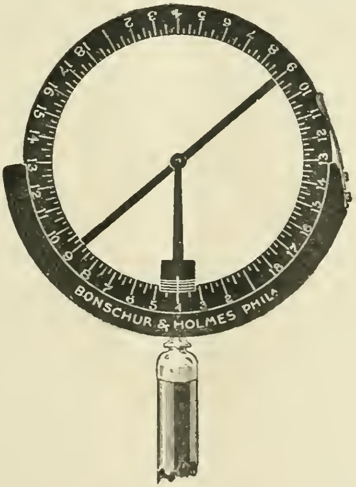

FIG. 3.

Subjective.—(5) It facilitates the determination of the inclination of the principal meridians rendered apparent by the elongated image of a small circular object. Observation is directed towards an illuminated circular aperture, not exceeding one centimetre in diameter, in a screen five or six metres from the eyes. The patient places the diameter parallel with the long diameter of the distorted image, when the pendulum or zenith will indicate the inclination of one principal meridian.

(6) The apparent inclination of a vertical object, due to paralysis of an oblique muscle, is denoted by the corresponding inclination of the diameter as seen by the unaffected eye.

(7) Useful information may be obtained concerning the relative positions of the double images caused by paralysis of the extrinsic muscles, which it may be desirable to correct by a prism inclined to a corresponding degree.

FUCHS (Vienna). Kerato-Mycosis Aspergillina.

Wiener Klin. Wochensch., No. 17, 1894.

A man, age 53, had an attack of inflammation in one eye in December last, attended by fever; the fever disappeared after a few days, but the eye remained inflamed. The patient was treated for a time with hot fomentations and atropine without benefit, and when first seen, towards the end of January, presented the following singular appearance:—

The conjunctiva of the lid was red and covered by a papillary overgrowth like trachoma, except that the retrotarsal fold was free; the lacrymal apparatus was normal. There was marked dusky ciliary infection; the cornea in its central part had an intense grey opacity 7 mm. in diameter, separated by a sharply curved edge from the rest of the cornea; the surface of this part of the cornea was dry, yellow, and crumbling. The lower part of the anterior chamber was filled with hypopyon and some posterior synechiæ were present. The central part of the cornea was removed without difficulty by forceps, but in the next few days was reproduced; the whole of the diseased area of the cornea was in consequence dissected off with knife and scissors, leaving the cornea clear but thinned. In spite of this the disease reappeared in two places; but after removal of these the patient was lost sight of. Some of the removed portion was examined bacteriologically and cultivated by Professor Gruber and found to be aspergillus fumigatus; the rest of it was hardened and stained.

The central part of the opacity was separated by a furrow from the surrounding cornea, and was completely necrotic and penetrated with the mycelia of the growth; to judge by its thickness it included the anterior half of the cornea. This portion had lost its epithelium, and was separated from the living corneal tissue, but there was scarcely any cellular infiltration to be seen; a few solitary leucocytes had wandered into the dead part. Further, although there was a certain amount of cellular exudation in the living tissue around the dead portion, the limitation of the mycelial growth was not brought about by a great heaping up of exudation cells, such as Leber said was usual. This small amount of inflammatory reaction agreed with the clinically torpid course of the disease.

Hitherto only two cases of keratitis due to fungoid growth have been recognised. The first one was recorded by Leber (*v. Graefe's Archiv.*, xxv., ii., 285) and was caused by a growth of aspergillus fumigatus; the other case was recorded by Berliner and Uhthoff (*v. Graefe's Archiv.*, xxix., iii., 179); the nature of the fungoid growth was not determined. Both of these cases were the result of an injury, by which the fungus had probably been carried into the eye; in the present recorded case there was no injury, the affection began as a slight inflammatory attack, possibly a herpes febrilis, and exposure to dust in his occupation as miller brought about the necessary infection of the ulcer.

The course of the three cases occurring in man agrees remarkably with the affection brought about in the cornea of rabbits by inoculation. In the course of the first week there appears an opaque spot on the cornea at the seat of infection, with a crescentic or circular yellow band around it; the separating suppurative line arises later, and this, by its breaking down, establishes a furrow between the living and dead parts.

Aspergillus has already been seen in men in two other organs, in the lungs and membrana tympani; the first case of growth in the lungs in a living man was described by Virchow. The opinion formerly held that growths of this nature were only saprophytic is known now not to be the case, since some of them, notably the aspergillus fumigatus, can penetrate and grow in healthy tissues. There is no doubt that in the three observed and recorded cases the fungus did not first enter the dead cornea, but that its growth in the living cornea was the cause of the keratitis.

W. T. HOLMES SPICER.

H. KNAPP (New York). On the Tolerance of Foreign Bodies in the Background of the Eye. *Archives of Ophthal., xxiii., p.* 172.

This is an additional note to the author's original paper on this subject, "Foreign Bodies Tolerated in the Background of the Eye, with Preservation of Good Sight,"[1] and refers chiefly to one case in which the conditions were somewhat unusual. Knapp has seen several others since he wrote his first article, but we may pass direct to the most recently published case, details of which are pretty fully given in the present paper.

J. Q., aged 40, a carpenter, consulted the author in Aug.,

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[1] *Archives of Ophthal.*, vol. xi., p. 222, 1882.

1882, on account of dilatation of the pupil and some dimness of sight in the left eye. His occupation entails a great deal of hammering, and also cutting iron with a cold chisel, and he says that pieces frequently fly off. The eye had never been inflamed, and he does not remember any particular injury to have happened to it, although he knew that it was "hit now and then." Examination showed the pupils to be of different sizes. Right 5 mm., left 8 mm., both acted to light. Vision of each eye was $\frac{20}{20}$, and he could read fine type with either. There was a defect in the upper and outer part of the left field, and, corresponding to this visual defect, the vitreous showed, down and in, a string of white shining flakes, small and floating and stretching forwards, apparently nearly to the posterior pole of the lens. Otherwise the media were clear. The string of vitreous opacities is connected with an oval ring-shaped band at the background of the eye, containing in its centre a fragment of broken steel, or at least what looked very much like steel, or a scale of iron. It was clearly defined, of shining grey colour, sharply curved at either end, and with a knife-like edge. It ran obliquely backwards, the lower part, which was sticking in the sclerotic, being covered with a dull white fibroid mass, while the rest projected forwards, uncovered, into the vitreous. The length was about 1·5, the breadth about ·25 disc diameters. The globe was very carefully examined for any scar or sign of previous injury, but nothing could be found. Sclerotic, cornea, iris and lens were all, so far as could be made out, perfectly normal. The retina was in its proper position everywhere, and was healthy, except that below the foreign body there were some slight pigment changes.

The patient had no trouble for a year. In August, 1883, however, he came again, saying that for the last three weeks the eye had been inflamed, and the sight dim. Pupil was small and iritis well marked. V. = $\frac{6}{200}$. Media turbid; the previous site of the foreign body could be seen, but the piece of steel itself had left it. There were small white particles moving through the vitreous. The irido-choroiditis, once set up, went on until a few days later it was necessary to enucleate the eye. No sympathetic inflammation. Patient recovered rapidly.

This case, as Knapp points out, shows that foreign bodies in the background of the eye can never be trusted, however thoroughly they may seem to be tolerated; the tolerance may of course be absolute or permanent, especially if the foreign bodies are small, or the accompanying change trifling, but we can never be sure.

The writer concludes his short paper with a reference to two cases, in which fragments of iron had entered through the cornea and lens, and produced cataract. The other eye, in each instance, had been lost. There was little or no inflammation in either case, but Knapp preferred to leave the foreign bodies alone, hoping that they would become encapsuled, to stirring up the vitreous with a magnet needle on the chance of removing them. Both did well, the lenses were subsequently removed and the patients were under observation for years. No foreign body could ever be discovered in either, and the eyes remained healthy and the sight good. N. M. ML.

W. H. BATES (New York). A Suggested Operation to correct Astigmatism. *Archives of Ophthal. xxiii., p. 9.*

This is only a brief paper and needs but a brief reference, but it is worth while drawing the attention of our readers to the suggestion.

Acting on the recognised fact that the contraction of corneal scars produces permanent corneal astigmatism, the author goes on to say that it might be an advisable proceeding so to incise the cornea as to produce an alteration in the radius of its curvature, with the object of modifying an astigmatism and making the error of refraction less.

He cites a few cases to prove his original statement as to the effect of incisions in the cornea on the curve of that structure, but this has been so long known and acknowledged that we should have thought it hardly required substantiation. The difficulty is to estimate with any accuracy at all, or at least with accuracy sufficient to make it reliable, the amount of alteration in the corneal curve which is likely to be caused by any given incision. Thus, in one case quoted by Bates, where the cornea was divided with the object of removing a foreign body lying on the upper pupillary margin of the iris, a regular astigmatism of no less than 9D. was produced, while in others the amount was much less, but varied within wide limits. The nearer the incision is to the centre of the cornea the greater the amount of astigmatism produced.

We quote the author's "propositions" and add a short account of the operation as he did it:—

"(1) A corneal incision lengthens the radius of curvature of that corneal meridian which is at right angles to the line of the incision, and does not flatten any other meridian. The astigmatism produced is a regular astigmatism, and is corrected by a convex cylinder at an axis parallel to the line of the incision.

"(2) The immediate result is greater than the ultimate result.

"(3) The astigmatism produced is permanent after a length of time, at least a month after the cornea has healed. There may be at first 3D. of astigmatism produced. At the end of a month there may be 2D. At the end of three months the astigmatism may still be 2D., and this amount of astigmatism will be permanent.

"(4) The amount of astigmatism produced is greater, the nearer the incision is to the centre of the cornea; as much as 9D. can be produced.

"(5) Mixed astigmatism occurs (*a*) temporarily, (*b*) with incarceration of the iris."

The operation suggested consists simply in making incisions in the cornea at right angles to the most convex meridian. The amount of correction can be regulated, says the writer, though we take leave to be rather sceptical on the point, by the number, depth, and situation of the incisions.

The operation was performed tentatively on two cases, to one of which only we refer, as the published notes of the second case are too meagre to afford much evidence one way or another.

A girl, age 14, had compound myopic astigmatism.

Oct. 30, 1891.—The left eye was found by the ophthalmometer to have 2·5D. of astigmatism with the meridian of greater curvature at 75°.

Nov. 2.—The first corneal incision was made with a Graefe's cataract knife, the edge of the knife cutting the cornea from without inwards. The incision was made in an axis of 165°, and accuracy of direction was attained by keeping the cut parallel to the upper edge of a strip of plaster, previously applied below the eye at the axis in which it was desired to incise the cornea. There was no escape of aqueous and no pain.

Nov. 8.—For the first time the vision of the left eye was equal to that of the right (it is a pity the author has not stated the vision in figures, either before or after the operation: they are always more convincing than mere general statements), but the ophthalmometer showed no change in the corneal astigmatism. The operation was repeated four times within three months, but no effect on the corneal astigmatism could be discovered by the ophthalmometer.

The final note on April 24, 1893—about eighteen months after the first incision was made—is as follows :—

"The vision of the operated eye is still certainly improved. No scar can be observed by ordinary inspection."

N. M. ML.

J. **ELIASBERG** (Salonich). A Study of Ophthalmoplegia in Young Children. *Centralblatt für prakt. Augenheilk., May and June*, 1894.

The following case is reported by the author. S. A., an infant girl, eleven months old, was brought to him for the first time about the middle of June, 1892.

Present Condition.—Ptosis on both sides. Right: divergent, paralytic strabismus; immobility of globe inwards, upwards and downwards. The power of movement outwards only is retained. Left: beyond the ptosis already referred to, there is nothing unusual to note in the condition of this eye. Child is subject to diarrhœa, and is not very vigorous; otherwise its general health is fairly good. A noteworthy fact is that the infant raises the left upper lid with its right hand in order to follow movements of an object in front of it.

The history is shortly as follows. Nothing peculiar was observed until the child was five months old. About this time the mother noticed that the right eye began to diverge. The squint remained present for fifteen days, and then the eye regained its normal position. About a fortnight later, however, the strabismus re-appeared, and has persisted ever since. After the lapse of two months more a double-sided ptosis set in, and this was preceded by a febrile condition, moderate in intensity and rather indefinite in nature, which lasted on and off for some three weeks. The prognosis was reserved; the child was seen again six months later, but no change in its condition had occurred. It has not been seen since.

We have before us, then, a case of double-sided ptosis and one-sided paralysis of the external muscles supplied by the third nerve. What is the probable lesion?

The nerve may be injured in any part of its course, for example, in the finer intra-muscular branches in the orbit, or at the base of the brain, as for instance, by compression due to a tumour, or again, in the brain itself. The author arrives at his diagnosis by a process of exclusion, and perhaps it may be well to follow him briefly in the steps of his argument.

First of all we must set aside a cause of paralysis which is very unusual and has not been much referred to in the literature, viz., hyaline degeneration of the muscle itself. A case of paralysis of the external ocular muscles following this affection has been described by Noél,[1] but it is obvious that in our author's patient this cannot have been the cause of the disease. The lesion must be a definite nerve one, and not a general affection such as that above referred to. We may also exclude injury to the intramuscular nerve branches; both the history and the double-sided nature of the paralysis speak against this. There are only two kinds of malady which, in Eliasberg's opinion, would be likely to bring about ocular paralysis by injuring the small intra-muscular nerve twigs, and these are trichinosis and neoplasms. It is very improbable that a lesion of this nature due to the presence of a growth would occur simultaneously on both sides, and so far as trichinosis is concerned, that, in the present instance, may be set aside at once.

Against the presence of an orbital lesion, to which the onset of the disease might be ascribed, is the fact that both third nerves are affected—a very unlikely occurrence were the site of the mischief an orbital one; moreover, there is absolutely nothing in the state of the eyes or orbits to suggest any such probability. There is no proptosis on either side and nothing abnormal to be felt. So much for the possible extracranial lesions.

As regards the intracranial ones, the writer points out that of course the malady from which the patient was suffering might have a basal origin due to growth or inflammatory action of some kind in that situation. Were such the case, however, he cannot but think that the close proximity of the cranial nerves at the base of the brain would have made an isolated affection like that with which we have here to deal almost inconceivable—in other words, that the other nerves could not have entirely escaped, and that there would have been manifestations elsewhere indicative of their injury.

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[1] *Archiv. d'Ophtal.*, xiii., p 76.

So far as cortical lesions are concerned, he excludes them, because isolated paralysis of the muscles of the eye is not usually referable to such a cause. It is true, cases of isolated ptosis in connection with cortical lesions have been described, but as a rule it is associated, not individual paralysis, which we may expect to find following injuries in the cortex.

The origin must, therefore, be either of what Mauthner calls a fascicular nature, or it must be nuclear. Controverting the likelihood of its being fascicular, is the fact that third-nerve paralysis of this kind is not double, and is often accompanied by paralysis of the extremities of the opposite side of the body. There remains only the nuclear origin, and that this is the actual character of the disease is borne out, not only by the process of exclusion already detailed, but also by the way in which the onset of the malady in the author's patient closely corresponded to the usual history of nuclear third-nerve affections as described by Mauthner. He says that the symptoms come on gradually, as a rule at least, and that in the early stages they subside or entirely disappear, or they again return until the paralysis becomes stationary. This description tallies accurately with the history of the paralysis in the present case.

The author has searched the literature of the subject and can find no recorded instance of this disease having begun so early (five months) as in his. He does not think that it was congenital; first, because its history is not suggestive of such a conclusion, and next, because the child used only the left eye for purposes of sight. He interprets this to mean that the onset of the illness cannot have occurred until the child had learnt to fix; he argues that the facts suggest the following explanation, viz., that just about the time when the infant had learnt to fix, the right eye began to diverge, and must have interfered with binocular vision and clear sight. The child, therefore, to overcome this difficulty, came to suppress the right image and to depend on the left eye alone. Then followed the double ptosis, but inasmuch as the right eye had already been discarded, the infant raised with its right hand the left, not the right, upper lid—a somewhat awkward proceeding at best—in order to utilise that eye which previous experience had taught it to be the more useful one. If the author's reasoning is correct we certainly agree with him that the disease is unlikely to have been congenital.

The rest of the paper is mainly historical, and does not concern us here. N. M. ML.

R. SIMON (Berlin). On Typical Violet Blindness in Albuminuric Retinitis. *Centralblatt für prakt. Augenheilk., May*, 1894.

Little reference has been made in the text-books to the anomalies of colour vision in neuritis and albuminuric retinitis. Most authors either say nothing whatever on the subject, or assume that the colour sense in such cases is undisturbed. A few mention that it is sometimes slightly modified, but do not enter into particulars with reference to it. Leber also believes that in ocular disease of this class the colour vision is unchanged, except, indeed, where a large central scotoma is present.

The author has recently had under his care some patients suffering from albuminuric neuro-retinitis who exhibited a definite amount of colour blindness which he believes to be characteristic of the malady. The notes of the cases are as follows:—

(1) J. L., a waiter, 28 years old, came to consult him about his eyes on January 17, 1894. The history was that for about four weeks he had noticed sparks and flashes before his eyes, and his sight had at the same time slightly deteriorated. During the last week or two vision had become very much worse.

On both sides there is exceedingly well marked neuroretinitis albuminurica. The disc borders are obliterated, the arteries narrowed, the veins enlarged. Hæmorrhages are present in both fundi, and there are also patches of white exudation arranged roughly in a ring-shaped formation round the nerve entrance, but at the same time widely spread over both retinæ. V. of R. = fingers at several metres, of L. = $\frac{1}{2}$. The right field is of normal extent, but there is a central scotoma for white, which, however, is a little indefinite and difficult to be sure of. There is no doubt as to the presence of a relative central scotoma for red and green; both colours are perceived, but with greater distinctness towards the periphery than at the centre. Blue in the periphery is easily distinguished, but as we approach the area of central vision it becomes of a more greenish hue until at the centre itself it is a pure green. In the same way yellow is recognised at the outer part of the field, but at the middle is mistaken for white. Unfortunately the patient was so ill that it was impossible to make a more precise examination, and the field of the left eye had to remain undetermined. He died shortly afterwards.

(2) B. F., aged 37, consulted the writer in February of the present year. There was definite albuminuric retinitis. He complained that the sight of the left eye had been bad for three weeks. Right, emmetropic. V. = $\frac{6}{6}$. Left, hypermetropic. V. = $\frac{6}{36}$, with + 1·5 = $\frac{6}{8}$. The margins of both papillæ are rather badly defined, and in both eyes the vessels are unduly—indeed, almost excessively—narrowed. The temporal halves of the discs are greyish-white, the nasal halves redder, but still hardly of a normal red tone. The right fundus shows a few isolated hæmorrhages, and numerous small white patches about the macula, while further out in the periphery there are some minute sharply-defined spots which are coloured darkish red. In the left eye no hæmorrhages are present, but only small white patches, like those in the other eye; these are chiefly down and out, and are not nearly so numerous as in the right. Colour vision of the right eye is good, even when tested with very small objects. The left eye has

perfect colour vision, so far as green and red are concerned; yellow is mistaken for white when the coloured disc is small, *e.g.*, 1·5 mm. Blue is recognised correctly in the periphery; towards the centre it appears greener, and at the centre perfectly green.

On March 21 (about five weeks later) the condition of the right eye was unaltered, the sight of the left had sunk to $\frac{1}{3}$, and ophthalmoscopic examination showed numerous white areas about the macula, and in a large circle round it. The defect of colour vision in the left was, perhaps, slightly increased, but not different in its type.

(3) In a third case recorded by Simon, he found both nerves more or less affected, but a definite central change in the right fundus only. Here the colour vision was normal in the left, but in the right eye over an area of $2\frac{1}{2}$ to 3° in the middle of the field blue was, as in the other cases, mistaken for green.

Two other examples of albuminuric neuro-retinitis, recently seen by the author, but details of which he does not give, seem to bear out, so far as they go, the impression suggested by the others, viz., that in cases where the disease is chiefly localised about the optic nerve, the colour sense remains intact, while in those where more extended retinal mischief has occurred it becomes affected. Thus, in one of these two cases, the right eye showed marked retinitis, the left marked neuritis. Colour field of the left was good in all respects, but in the right there was a scotoma, not only for colours, but also for white. In the other case the right eye was normal; the left showed definite changes in the nerve, but little retinal disease. Colour vision was not disturbed.

The total number of cases which have been examined or recorded, says the author, is so small that it is impossible to determine in what percentage these colour perception anomalies occur. We may, however, he thinks, safely assume that this loss of power to recognise yellow, and especially blue tints, is of pretty frequent occurrence in pronounced albuminuric retinitis, and he is the more surprised that in the recent literature he can find nothing, or practically nothing, about it. Mauthner, indeed, in 1881 made a statement on the point. He observed an abnormality of colour vision similar to that which was present in Simon's patients, in a case of disseminated choroiditis, and was thus led to make a careful examination of the colour vision in persons who were suffering from central retinal disease. He arrived at the conclusion that where the disease is macular there is very frequently a disturbance of colour sense which shows itself in a tendency to see blue as green. He convinced himself also that this was so, whether the primary seat of the injury, so far as the eye is concerned, was in the retina, as for example, in Bright's disease, or in the choroid, and transmitted thence only secondarily to the retina.

That the defect in colour sight occurs only where the retina is affected, and not where the malady is limited, or nearly limited to the nerve, cannot be argued with any degree of certainty from a study of Simon's cases; the reason is obvious. In no instance which he records could the nerve be said to be absolutely healthy, and this, of course, is the general rule in such cases; it is perfectly legitimate to argue, therefore, that if both retina and optic nerve are injured, both may participate in causing the colour defect which follows; at least we cannot exclude the nerve as a possible source of the mischief. On the other hand, it is surely very suggestive that in those cases where the retina was left intact, there was no alteration in the recognition of colours. To go a step farther, we have to remember that in other classes of disease—not albuminuric—in which the retina was affected exclusively, a similar loss of colour vision has been observed. Leber, for example, found that in some cases of retinal detachment, although by no means always, still in a considerable number, the same confusion between blue and green was present, and other authors have noticed the same thing.

The subject is interesting, and worth further investigation. The interest, of course, centres chiefly in the theoretical questions which it suggests; but into these it is impossible—within the limits of a brief review—to enter.

N. M. ML.

THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 6, 1894.

D. ARGYLL ROBERTSON, M.D., F.R.S.E., President, in the Chair.

A New Operation for Trichiasis and Distichiasis.—Mr. W. Spencer Watson read this paper. A bridge was formed by incisions parallel to one another and to the margin of the lid, including in its substance the whole of the faulty eyelashes; a "button-hole" lying horizontally above the margin of the lid was thus formed. Into this "button-hole" a "button" marked out in the skin immediately above it by a semilunar incision was turned, and fixed *in situ* by sutures. The result was to place a band of skin, which soon became partly mucoid in character, at the margin of the eyelid; by this means the transplanted eyelashes were quite removed from the cornea and assumed in their growth a normal horizontal direction. A case exhibited showed the advantages of this method of operating.

Dr. Brailey believed that the operation did not remedy the faulty curve of the upper lid, whereby the cornea was unduly pressed on.

Mr. Benson thought Mr. Spencer Watson was entitled to great credit for introducing the whole series of transposition operations for the relief of deformities of the lids. He thought that this operation was inferior to Van Millingen's operation and its various modifications now in use. The disadvantage of Spencer Watson's operation was that the skin did not turn into satisfactory mucous membrane, small hairs still remained in the skin, and the epithelium was different from that of the cornea, and was always harmful to it.

Mr. Spencer Watson, in reply, described his first operation and the difference between it and the present method. In his experience, although the skin did not become a true mucous membrane, it did assume a mucoid character, and was not harmful to the cornea.

Monocular Asteroid Hyalitis.—This paper was read by

Mr. Arthur Benson (Dublin). Captain ——, aged 62, was in good health, but was suffering from asthenopia and muscæ in the right eye ($V. = \frac{6}{9}$. J. 1, and $H + 0{\cdot}75$ D.). This he attributed to overstrain, caused by excessive and prolonged use of the eyes some thirty years before. He had syphilis as a young man, but there had been no manifestation since. The right vitreous was found to be thickly studded through and through with hundreds of small, stationary, cream-coloured spheres, arranged apparently without system, and varying in size from extreme minuteness to about a quarter of a millimetre or so in diameter. They suggested the appearance of stars on a clear night so strongly that the name "asteroid hyalitis" seemed suitable, their pathology being unknown. As the eye was otherwise quite normal, and as the vision in it was practically equal to that of its fellow, Mr. Benson thought that the condition was probably congenital. It was not caused by cholesterin crystals, nor did it at all resemble the hyalitis punctata seen in syphilis or in serous cyclitis. It had remained quite unchanged during nine months while under Mr. Benson's observation. In his experience the case was unique.

The President had seen a similar case, except that the spheres floated about instead of being stationary; in his case there was also incipient cataract.

Mr. Lang had also seen a case of spheroidal bodies in the vitreous, but they were movable. The vision was unaffected.

Mr. Jessop suggested that, as these bodies were fixed and were seen with $+32$ D., they might be in the lens; he thought that no body in the vitreous could be quite fixed.

Dr. Batten referred to a case of spheroidal bodies in the front part of the vitreous in a myopic patient of advanced age.

Mr. Benson, in reply, said that the bodies were not confined to the front part of the vitreous, but were closely distributed through the whole vitreous from the back to the front.

Notes of a Case of Sympathetic Ophthalmia of the Right Eye *which showed itself eighteen days after a Kick in the Left Eye.*—This paper was read by Dr. Adolph Bronner (Bradford). There were no signs of external wound nor of rupture of the left eye. The eye was enucleated, but there had been several recurrent attacks of typical sympathetic ophthalmia of the right eye during the last two years, serous iritis with opacities of the aqueous and vitreous and slight inflammation of the optic nerve. Twenty similar cases had been recorded, of which, however, only 5 were genuine. In 4 of these 5 the uveal tract of the injured eye was diseased. These cases seemed to speak strongly against the microbic origin of sympathetic ophthalmia.

The Use of Chlorine Water in Certain Diseases of the Eye.—This paper was read by Mr. Lawford. He gave notes of cases in which it had proved of real service. His experience of it as an intraocular application was limited to two cases; in both instances suppuration in the anterior chamber was arrested after the use of liquor chlori. The other cases in which the solution had been used included purulent conjunctivitis, membranous conjunctivitis, suppurating ulcers of cornea, and purulent dacryocystitis.

Mr. Power had used aqua chlori not infrequently, but almost entirely in diphtheritic cases.

Mr. Lang employed chlorine water at times. He had used it once as an intraocular injection in suppuration of the globe; the suppuration was arrested, but though the eye was retained, it subsequently shrank. He had also used it in hypopyon and corneal suppuration, but without uniformly satisfactory results.

Mr. Lawford, in reply, said that Dr. Berry had found suppuration in the vitreous arrested after the use of chlorine water. He himself had never used it in the vitreous; he had found it very satisfactory in one case of diphtheria. Von Graefe had recommended it in granular lids, but he had had no experience of this.

Card Specimens.—Mr. Griffith: Case of Filamentary Keratitis.—Mr. Power: Section of the Orbit in a case of Congenital Exophthalmos in an Infant.—Mr. Jessop: Case of Sloughing of both Eyelids and Eyeball in an Infant with subsequent complete cicatrisation.

CRITICISM CONCERNING RECENT VIEWS AS TO THE SECRETORY FUNCTION OF THE CILIARY BODY.[1]

By John Griffith, F.R.C.S.

Pathologist at the Royal Westminster Ophthalmic Hospital.

A critical review of this subject from its infancy would entail endless labour, necessitate a long rigmarole of different views and results of experimental study, and in the end, could scarcely be anything else than a feeble shadow of the masterly writing of Dr. W. Nicati, of Marseilles.

Nicati[2] has in this recent work of his on the origin and destination of the aqueous humour, made an exhaustive collection of literature pertaining to it, entered fully into the anatomy and physiology of the ciliary region, besides giving a description of his own experimental researches and the conclusions he has arrived at. So recent and thorough a revision would leave little to write about, but for the opening up of a wider question due to the discovery of ciliary glands by Mr. Treacher Collins[3] in this country, almost at the same time as Nicati was elucidating the problem in France.

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[1] Read at the Annual Meeting of the British Medical Association held at Bristol, July, 1894.

[2] "La glande de l'humeur aqueuse," *Archives d'Ophthalmologie*, 1890, p. 481.

[3] "The Glands of the Ciliary Body in the Human Eye," *Trans. Opth. Soc.*, vol. xi., p. 55.

Ophthal. Review, Vol. XIII., No. 154, Aug., 1894.

Collins, who has made a special study of the histology of the eye, attributes the formation of the aqueous humour to these glands. Many English ophthalmologists have accepted his theory without dissent ; others still cling to the older view that the ciliary processes form the fountain-head of this intra-ocular secretion.

Nicati terms the pars ciliaris retinæ, together with the subjacent pigmentary epithelium, "the gland of the aqueous humour, the gland of the ciliary processes, or the uveal gland," and considers it the elaborating organ through which the blood serum derived from the choriocapillaris passes in its preparation for aqueous fluid.

It has been sufficiently proved by the many experiments of Deutschmann, Ehrlich, Schoeler and Uhthoff, Leplat, Memorsky, Leber and others, that the ciliary region is responsible for this fluid, and so any discussion on that point would be superfluous.

A preliminary account of the histology of the ciliary region must obviously be necessary to place the subject on a sound footing.

On looking at the inner aspect of the anterior half of a bisected eye from which the vitreous and lens have been removed, two zones are visible between the ora serrata and the base of the iris, a posterior, wider and darker zone without any distinct elevations—the pars non-plicata—and an anterior, narrower, and lighter portion which is thrown into numerous meridional ridges—the pars plicata.

The pars plicata is an apparently complex structure, for it has given rise to many misshapen views and ideas especially among microscopists, yet a correct knowledge of its anatomy, described by Brailey,[1] simplifies it considerably. Under the microscope these ciliary processes or ridges appear to be broken up into papillæ, the anterior of which often look as if they were folded backwards. This is not really the case, but is a deception due to their strange undulating outline. It is, as one would expect, difficult, perhaps impossible, to get a perfect antero-posterior section of any single ridge. This undulating appearance is readily seen and understood in sections cut through a plane at right angles to their perpendicular meridian; also in coronal sections. The acme of each ridge is in front, their height being a little less than 1 mm., their length about 1.5 mm.

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[1] "Some Points in the Anatomy of the Ciliary Body," *Brit. Med. Jour.*, vol. ii., 1882, p. 577.

Around the circumference of the lens there are about seventy of these ridges, and in the hollows between are smaller ridges. Sometimes two of the latter are seen which coalesce anteriorly either by the gradual rising up of the floor between them, or, as pointed out by Brailey, by the fusion of their summits, which gives rise to short cæcal pits directed forwards. The appearance produced by the undulations of the approximate sides of adjacent large ridges, with the folded arrangement of the intervening embryonic ones is very striking, and has a resemblance to a racemose gland. The re-duplications are very extensive, and must increase the surface area of the anterior plicated zone considerably.

Upon microscopic examination we find that the retina, not taking into account its pigmented epithelium, ceases at the ora serrata 5.5 mm. behind the sclero-corneal junction. Here its structural elements resolve themselves into a single layer of elongated cells having a decided inclination forwards. This can be traced as a non-pigmented membrane as far as the base of the iris, and constitutes the pars ciliaris retinæ.

In the hinder part of the non-plicated portion of the ciliary body these cells are elongated and fusiform, subsiding gradually into columnar, and lastly, cubical shaped elements as they reach forwards to the ciliary processes, around which they also retain a cubical form. From some of them, which no doubt are epiblastic and the representative of the retina, cords arise which, blending with the outer layer of the split hyaloid membrane, constitute the main structure of the suspensory ligament of the lens, and are inserted into the anterior aspect of the lens capsule near its equator.

The structural peculiarities of the pigmentary epithelium in this region, the continuation forwards of the tapetum nigrum of the retina, demand the fullest investigation. This can only be done by studying bleached sections, and to Collins is due the credit of having first attempted this with success. He points out the difficulty of his method in the following words: —"The manipulation of the sections requires considerable care, as after exposure for some time to chlorine they have a great tendency to come to pieces;" (he then describes how they fall away and adds) "It is not easy to get a perfect section first bleached and then stained."

I fully endorse Collins' statement, having on several occasions attempted his method without success. The plan I have adopted is, to my mind, decidedly better than his, as the chief difficulty—viz., the brittleness of the specimen—is overcome. The tissue is bleached *en bloc*, it cuts without difficulty, and the sections, not in the least brittle, will stain with eosin. In fact, there is no trouble at all in the process if attention to detail be carried out. Many other bleaching solutions have been tried without success. Peroxide of hydrogen has proved too slow an agent in my hands, though its bleaching properties are held in high esteem by some.

The solution I recommend owes its bleaching powers, I am told, to the presence of euchlorine, which is a simple mixture of chlorine and chloric di-oxide:—

$$8\,KClO_3 + 24\,HCl = 8\,KCl + 9\,Cl_2 + 6\,ClO_2 + 12\,H_2O$$

Bleached sections show upon examination a single layer of columnar, not flattened, cells, underlying the pars ciliaris retinæ, extending from the ora serrata to the bases of the ciliary processes. The rounded outer extremities of these cells, sometimes devoid of pigment, appear separated from the lamina vitrea by a small interval, presumably a lymph channel. Their inner ends can be distinguished from the cells of the pars ciliaris retinæ by a delicate crenulated line. Between the individual cells slender sustentacular fibres can be seen standing on the membrane of Bruch by their triangular bases. Around the ciliary ridges these cells are cubical, and contain comparatively little pigment, especially those at the summits of the ridges. This single row of columnar cells throughout the length of the pars non-plicata I have seen only in the ciliary region of glaucomatous eyes, yet I consider it a normal condition.

In healthy eyes—those, for example, removed for injury or *post-mortem*—they are in some parts seen to be reduplicated by doubling outwards, similar to the backward folding of the cells constituting the pars retinalis iridis. This condition of the cells on the back of the iris appears dependent upon the movements of the latter; such an active membrane must have some arrangement of this kind. The more dilated the pupil the more corrugated would be its epithelium, and the converse. Similarly, we must expect changes in the epithelium of the ciliary region resulting from the act of accommodation. In eyes in which I have found the pigmented epithelium thrown into folds, I have also found the lamina vitrea wrinkled, whereas in eyes in which only a single layer can be seen, this membrane of Bruch is found taut. The only inference that can be drawn from these facts is that they depend upon the contraction of the ciliary muscle. The forward direction of the cells of the pars ciliaris retinæ, and their intimate relation to the fibres which form the suspensory ligament of the lens, will account for the absence of folding in them. It is probable that they elongate during accommodation. If, therefore, we find the pigmented epithelium a corrugated membrane it is due to the rigor mortis state of the ciliary muscle, just as we often see similar *post-mortem* contractions in the unstriped muscle fibres of the intestinal tract.

Before I discuss the existence of true ciliary glands, allow me to make a few remarks on the apparent glands of this region.

How very difficult it is to make a complete antero-posterior section of a single ciliary ridge without passing through one or other of its side-walls, owing to their sinuous outline, has already been pointed out. Consequently, a closed space, or one opening by a narrow neck, may often be seen lined with both layers of epithelium, and may be mistaken for a gland.

Again, the extensive folding between the processes may simulate a racemose gland, though, here also, both layers of epithelium are seen. Greeff thought that Collins in his communication referred to these apparent glands, and therefore objected to the term "glands of the aqueous humour," preferring the expression " secreting surface," for it is only an infolding of the surface epithelium and not a true glandular formation. I might incidentally mention that he is not alone in this wrong impression. A section through one of those cæcal diverticula of Brailey would also be rather deceptive.

Another cause of error is the appearance of the pigmented columnar epithelium in the pars non-plicata, for each cell looks like a small simple tubular gland owing to its outer extremity being rounded, sharply defined in many instances by the pigment, and forming with other cells a row of finger-like processes. The outfolding of the pigmented cells from the contraction of the ciliary muscle already described is one that may also easily give rise to false deductions.

With so many fallacies and pitfalls, can we in safety acknowledge the existence of any true glands? Certainly we may; the tubular and pyriform glands described by Collins as existing at the junction of the plicated with the non-plicated portions of the ciliary body are true glandular structures, though not many in number or very large in size. They are cellular outgrowths from the pigmented epithelium, are flask-shaped or tubular, containing a lumen. Similar glands are seen between the ridges, and one or two in the pars non-plicata. It must be quite understood that the cells of the pars ciliaris retinæ do not participate in this outgrowth. Also, these glands in the natural state are deeply pigmented.

Beneath this melanotic epithelium the lamina vitrea is seen continuous with that of the choroid, and traceable as far as the ciliary ridges, where it becomes lost to view. Between this membrane and the ciliary muscle a connective tissue framework accompanies the vessels, nerves, &c. The vascular arrangement may briefly be described thus:—Around the circumference of the eyeball near the base of the iris within the ciliary body, there is an arterial circle from which branches proceed to each of the ciliary ridges and break up into a free inosculating plexus of fine capillaries on their walls; a venule forms at the summit of each fold, and, passing backwards along its free border, carries the venous blood away to the choroid. There is no similar dense capillary network in the pars non-plicata, in fact this region is more poorly supplied with blood than any other part of the tunica vasculosa of the eyeball. I have come to these conclusions mainly from the examination of injected eyes of albino rabbits, and so cannot be dogmatic, but I feel convinced from the examination of a number of specimens that this region is equally ill-favoured in the human eye.

Nicati is of opinion that the vascular arrangement of the ciliary processes is similar to that of the choroid; to quote his words, "the ciliary epithelium rests on a layer of vessels—an expansion of the chorio-capillaris." Judging from analogy it would not be right to accept this statement. It is not at all in accordance with what is seen on examining the injected tunica vasculosa of an albino rabbit on the flat; the sudden cessation of the chorio-capillaris and venous system of the choroid at the ora serrata is a most striking feature. The blood circulation of the choroid is quite characteristic, differing materially from that of the iris and ciliary body, and, stopping abruptly as it does at the ora serrata, must be for some special retinal purpose. This, however, Nicati does not allow, for he says that the chorio-capillaris lies between two impermeable membranes, the lamina vitrea internally and the intervascular membrane of Sattler (tapetum) externally, and any exudation from this capillary plexus must of necessity pass forwards to the ciliary region and there by a process of metabolism be converted into the aqueous humour. He boldly states that Sattler, with all other authors, is wrong in attributing to the chorio-capillaris the part of nutrition of the retina. This new origin of fluid to form the aqueous humour seems too theoretical to gain universal acceptance. Considering the fact that such a close meshwork of large capillaries exists over exactly the same area as the sensitive retina, and that it is especially fine at the back of the eyeball near the yellow spot (Schäfer[1]) it seems more feasible to accept Sattler's hypothesis. Extensive choroidal changes may occur without much alteration in the tension of the eye; if, however, cyclitis be present, the tension is raised and the subsequent atrophy of the ciliary body is attended with diminished tension. These points are certainly in favour of the fluid being derived from the blood vessels of the ciliary processes, as suggested by MacKenzie some years ago, rather than from those of the choroid.

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[1] "Quain's Anatomy," vol. iii., part iii., 1894.

Why should the membrane of Bruch be considered an impermeable structure, for similar membranes, the capsule of the lens and the hyaloid membrane, allow fluid to permeate them ?

Does the tapetum between the two vascular strata of the choroid in some mammals, or the analogous iridescent epithelial cells of Sattler, as seen in fish, exist in man ? No similar membrane can be seen with the microscope, and its presence seems more than doubtful.

What part the pyriform glands of Collins take in the secretion of the aqueous fluid is a point worthy of great consideration, for this function has been attributed to them by their discoverer. He bases his arguments partly on histological and partly on pathological grounds. The existence of a few glands in the ciliary body appears to be the sole evidence that can carry any weight in favour of his theory. I emphasise the " few," because I have never been able to find the number stated by him. He says :—" Their number in any one section it is impossible to count. The number in the whole circumference of the globe must be something enormous."

Now I find with the exception of two or three glands in a single section, no other structure that can be considered glandular in the pars non-plicata, which, according to him, is a conglomeration of glands. I, of course, exclude the immediate vicinity of the ciliary processes. He may mistake the folding of the epithelium, which I attribute to the contraction of the ciliary muscle, for glands. The simple columnar cells, which somewhat resemble tubular glands while loaded with pigment granules, cannot possibly give rise to error when bleached.

Two fundamental facts justify the exclusion of these cellular plaits from the type of ordinary glandular formations. First of all, the absence of any corresponding depression in the basement membrane, which, here, is the lamina vitrea; secondly, the occasional absence of any such folding or reduplication of these cells. Besides, a gland must surely be composed of more than four or six cells, as seen on section, which these so-called glands never are. Would we not expect a free network of capillaries beneath these apparent glands if they were real? we have, however, no proof that such exists.

There is not sufficient time to allow me to enter fully into the pathological evidence which is brought forward. I must, however, deny the—as it seems to me—ridiculous theory of glandular hyperplasia in cyclitic membranes enunciated by Alt and accepted by Collins.

Can it be possible for a gland from the stimulus of inflammation to sprout out into a mass of inflammatory material and form a more highly organised structure than the original? Is it not contrary to all pathological dicta? Where can we find a parallel phenomenon? It is truly absurd, and cannot be contemplated as based on sound scientific principles. Some of these exuberant glands are in reality due to folding of the epithelium, both pigmented and non-pigmented, from the cicatricial contraction of the inflammatory material in the process of organisation. Others, and the variety to which Alt seems to refer, are those peculiar branching and anastomosing cellular rods or columns seen in so-called cyclitic membranes, some cells containing pigment, others not. Such are more sensibly explained by assuming them to be newly formed lymph channels congested with leucocytes, performing a useful work in clearing away the melanotic *débris* of disintegrated pigment cells from the site of the recent inflammatory battle—in other words, a process of phagocytosis.

Do the ciliary processes or the ciliary glands secrete the aqueous fluid? One ciliary process must be capable of secreting many times the quantity of several glands if size is to be taken into consideration. It is exceptional to find more than half a dozen glands in any one section. Let it be assumed for a moment that they do constitute the intraocular secretory apparatus. Then of what use are the ciliary ridges? Their existence must not be wholly disregarded; in fact, a more important function should be assigned to them in proportion to their prominence. But we cannot do so. Putting aside the question of size, it is possible to bring forward a more substantial argument against this glandular theory. Why did not Nicati recognise them? He makes no mention of them in his paper. The reason is obvious. He made his experiments and examinations chiefly on the eyes of albino rabbits; in them no such glands can be found, yet they are not devoid of an aqueous humour. What then secretes it? Presumably the ciliary processes which do exist.

Just a few words about the experiments of Greeff. He tapped the anterior chamber of a number of rabbits' eyes and examined them at different periods afterwards, and found the cells lining the processes, especially those on their anterior aspect, distended with coagulated fluid similar to the coagulable fluid which takes the place of the aqueous humour in the anterior chamber shortly after that cavity has been evacuated.

I have had the opportunity of examining the ciliary region of eyes which have been excised within a short time after perforating injuries. The cells of the ciliary ridges show a similar condition to that described by Greeff. The epithelium appears to be distorted with vacuoles which no doubt are aqueous droplets; they, however, have not taken, even faintly, any stain, so cannot be considered coagulated fibrin. This condition is no doubt an exaggerated form of the normal secretory process.

Seventy-four years ago,[1] John Vetch wrote as follows :—" In assigning to the ciliary processes the office of a gland, I was not aware that Dr. Young had already supposed that this might be their use, if the production of the aqueous humour required such an explanation. As the secretion of the fluid after closure of the pupil proves that it takes place behind the uvea, this destination of the ciliary processes is rendered very probable." There has arisen since that time little substantial evidence to overthrow Dr. Young's theory, and I sincerely believe that it is through the mediation of the ciliary processes alone that the aqueous humour is formed.

Having, as I think, refuted in the main the hypothesis expounded by Collins, I should not feel I had done so without prejudice, if I could not attribute some function to the ciliary glands which have been robbed of their colours. I have found them to exist in greater numbers and of large size in dark brown eyes ; in blue eyes they are present, but much less prominent ; and in the eyes of albino rabbits I have already said they are not to be found. It strikes me forcibly as highly probable that they control the amount of pigment in the eye, and regenerate it as Nature demands.

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[1] " A Practical Treatise on the Diseases of the Eye," by John Vetch. London, 1820.

DESCEMETITIS.[1]

By Herman Snellen.

Descemetitis, or serous iritis, is a distinct and well-known disease of the eye as to its symptoms. With regard to its nature, opinions vary much.

The earlier observers looked upon it as a disease *sui generis*, and according to this they called it aquo-capsulitis, keratitis punctata, or descemetitis. Later writers thought it merely a symptom of disease of the deeper parts of the eye, and as the iris is mostly more or less inflamed, they employed the name of iritis serosa.

Treacher Collins regards this disease as primarily a catarrhal inflammation of the glands of the ciliary body, and Priestley Smith, following out this idea, suggests that it should be called serous cyclitis instead of serous iritis. Fuchs, also, in his treatise, describes it as a cyclitis.

Most of the recent writers are agreed that the opaque dots upon the posterior surface of the cornea are deposits of pathological productions of some part of the uveal tract, and that they consist of cells and fibrin, and sometimes pigment granules.

I shall not enter more into details of the history of this disease, as Lawford has given an excellent *résumé* of it in the *Ophthalmic Hospital Reports* (1889).

In a case I had under my care about three months ago, I made an observation which gives, I think, a new view as to the nature of this disease.

A lady, aged 28, came to see me with a very marked descemetitis of the left eye. The lower third of the cornea was dotted with specks of different sizes. Also there was a similar dot on the anterior surface of the iris, extending beyond the free border, and touching the lens, in this way forming a posterior synechia. This dot, although larger than those on the cornea, was one of the first to be absorbed.

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[1] Read at the Annual Meeting of the British Medical Association, held at Bristol, July, 1894.

After dilating the pupil there could be observed also some circumscribed opacities in the lens, which I think were of the same nature.

Vision in this eye was $\frac{6}{8}$, after correcting a myopia of five dioptres. Intraocular tension was normal when the patient came, but increased considerably a few days afterwards, was normal again next day, and, in short, varied nearly every day. As after a fortnight the plus tension seemed to persist, and the cornea became hazy and the vision diminished, a sclerotomy was performed.

With the aqueous humour one of the dots came out, which I examined under the microscope. I was greatly surprised to find, not a cluster of cells, but a collection of microbes. As soon as possible they were transmitted to agar-agar, where they grew, but very slowly.

Closer examination, after staining with carbol fuchsine, showed that they were very short bacilli.

Almost at the same time a young man came into the hospital with descemetitis of the right eye, from which he had already suffered for more than three months.

As in this case also a paracentesis had to be performed, great care was taken to secure one of the dots; we succeeded in doing this, but not without difficulty, as the dot proved to be very adherent to the cornea. In this instance I found the cells as described in the handbooks, but between them were microbes similar to those seen in the first case.

I did not succeed in cultivating them. I suppose that this dot was an older one than the other, as it was more adherent to the cornea, that it had attached cells, and the microbes were already dying off. The remaining dots seemed to affect the deeper layers of the cornea, causing an infiltration of the cornea, after which they were absorbed, leaving only a small cicatrix. Under internal treatment with salicylate of soda the eye became quiet, and after a month the patient left the hospital, and has not come again since.

In both cases there was, as far as could be seen, no trace of alteration in the choroid ; there was a slight pericorneal injection, but no other symptom of iritis, and synechiæ were only formed where a dot had been situated.

Only a fortnight ago the lady referred to in our first case, who had left us, returned, complaining of irritation of the right eye. By focal illumination very small hazy spots were to be seen on the posterior surface of the cornea ; they became denser, and soon acquired the ordinary aspect of descemetitis. Here therefore I had the opportunity of observing the disease in its very first beginning. I can state that it is not true that the dots are exclusively situated in a triangular arrangement on the lower third of the cornea, as one was right at the top of the cornea, and several in the middle third. I am tempted to believe that the dots in the beginning often become loose, fall down, and stick again to the cornea in its lower part.

In this eye the affection ran a very rapid course. The number of opacities increased daily, the tension became increased, and the cornea hazy as in glaucoma. A sclerotomy was performed, and we succeeded in getting one of the dots. Microscopical examination after staining showed the same microbes as in the other eye.

The conclusions I come to are, in the first place, that descemetitis is really a disease *sui generis*, therefore I think it quite appropriate to take up again the old name of descemetitis instead of serous iritis or cyclitis. In the second place, that it is due to microbes growing in the anterior chamber, which by their producing toxines cause an irritation of the uveal tract. The dots are at first situated on the cornea; afterwards on the iris and lens, and may be also on the ciliary body. They contain in their early stages only microbes, but later are intermixed with leucocytes.

Whether all cases of descemetitis are due to the same cause, or whether in some cases it is a real deposit after inflammation of the deeper parts, further investigations have to decide.

A. NIEDEN (Wiesbaden). Der Nystagmus der Bergleute (Miners' Nystagmus). *Bergmann, Wiesbaden.*

The author is one of those who are well known for their work on this affection of miners; he has indeed devoted himself to the subject for nineteen years, and has observed 2,000 cases. He tells us in his preface that he was anxious to do for Germany what Dransart had done for France, Snell for England, and Romiée for Belgium. He has recorded his work in the volume before us, which is a carefully prepared monograph of 140 pages. The book is illustrated with ten reproductions of photographs, several of which represent the miner at his work in the mine, and have been taken by the magnesian flash light. In addition to this there are several figures in the text. Illustrations are also contributed by both Dransart and Snell. The work is divided into four chapters: (1) History and General Pathogenesis, (2) Symptomology and Course, (3) Special Pathogenesis, and Etiology, (4) Therapy.

In the first chapter the literature of the subject is fully dealt with. Nieden tells us that in 1874 he thought the affection was due to torpor of the retina, and founded a theory accordingly, which he had to give up in 1878 after more exact observation. He refers to the quite independent researches of Dransart, Snell, and himself, which have positively, he thinks, determined that miners' nystagmus is occasioned by the over-fatigued condition of the elevator group of muscles caused by the special work of the miners, especially hewers. He finds no support to the over-burdening of the accommodation asserted to be present by Romiée, and says that this would throw no light as to why there is sometimes vertical and sometimes horizontal nystagmus, and also why in most cases the movements are brought about by looking upward.

In the second chapter is a full description of the symptoms and course of the affection. He says that it may be accepted that nystagmus was present in the past but was not generally recognised as it is now, and thinks that in addition to the much more widely spread knowledge of the affection, there may probably be some difference in the way of getting the coal, and that changes in the management and lighting of pits have been introduced. At the same time the number of men working in coal mines has greatly increased. In England in the twenty years ending with 1890 the increase has been 69 per cent. and in Germany during the same period 50 per cent., or in the Westphalian coal district, in which his observations have chiefly been made, during the last fourteen years, 87 per cent. Among the characters of nystagmus he finds, as other observers have done, that the oscillations are brought about or increased by looking upwards, and either cease or are lessened by looking downwards, and furthermore, that a miner suffering from this will often take to a kind of work in which he can keep his gaze directed below the horizontal line. Patients learn, moreover, to control the movements by throwing the head back, and miners frequently adopt this position of head at their work. Nieden gives the motions in 77.5 per cent. of the cases as rotatory, 15 per cent. oscillatory, 7.5 per cent. mixed. The vertical form is rare, and he has seen it so little that he does not recognise it as a special form of miners' nystagmus. Nieden attempted to determine the number of the movements in order to make a classification into those of weak, medium, and severe degrees. He was not able to do this exactly, as the number of the oscillations varies under different circumstances, position of eyes, &c., but generally by fixing a conjunctival vessel, it was possible to make an estimate of the frequency of the movements. He gives the number as varying from 80 to 100 a minute, whilst Dransart gives 80 to 140, Snell 60 to 100 and more, Romiée 120 in the mildest and 500 in the most severe cases. Nieden thinks that Romiée's statement of over 500 in a minute can only be an approximate estimate. The author has made extensive investigations to arrive at accurate conclusions as to the frequency of nystagmus. Statistics only taken from cases at eye clinics would be misleading, as the men do not present themselves until the disease is developed, whereas in the greater number of instances it is latent. It is necessary, therefore, to examine the men at their work, and this he has done in the most complete manner. He chose mines where he could get the greatest number of workmen under observation with varying kinds of work, and different seams of coal, with or without safety lamps and with or without blasting. He saw some of the men at the early morning shift and some at the second shift in the afternoon. He examined the workings and observed the men returning to work, and also those who were leaving after eight hours' labour. He wished to know if the percentage in the tired workmen was greater than in those going fresh to their work, as in this way he could determine if the work had a direct influence on the attacks. After examining 5,000 men and finding that only a particular class of hewers (*i.e.*, those men working under the coal) were affected, he confined his observations to them.

He examined altogether 11,045 in 17 mines, and found 405 cases of acquired nystagmus, or 3.63 per cent., and he found also 1 per cent. more in men returning from, than in those who were going to, their work in the mine. He thinks that his statistics show the effect of fatigue to be undoubted. From 1874 to 1891 inclusive he had 16,837 miners under treatment for various eye complaints, among which 1,180 were cases of nystagmus, 7.1 being the relation to other eye diseases. This gives 5.70 per cent. in all the miners he had seen for various reasons. He thinks the much larger percentages given by Romiée in Belgium must be accounted for either by noting the slightest twitches or the work must be more unfavourable. From all computations he thinks it may be said that 5 per cent. of all miners have the disease in greater or less degree. He does not find hemeralopia to be present, and concludes from his observations that there is no relation between nystagmus and errors of refraction. He finds no more refraction anomalies than would ordinarily be found in a working population who did not use their eyes for near or fine work. He concludes with Snell that although errors of refraction are associated with the disorder, they have nothing to do with the nystagmus.

He does not agree with Romiée that the accommodation is defective, and he finds that patients can read well in a good light with the book held below the horizontal. He thinks that if the injurious hewers' work were to be continued the lower muscles would sometimes get disturbed as well as the elevators. Nieden saw three cases in this stage, and even then vision was not perceptibly diminished. The prognosis is favourable, but whether the cure will be rapid or slow depends on a variety of circumstances.

Nystagmus coming on after a weakening illness generally disappears quickly on recovery of strength, and further, the disease will show itself with violence in a man working under particularly unfavourable circumstances, and will rapidly disappear on improvement of these conditions, even without entirely giving up hewers' work.

Nieden observed this particularly with very tall men, because they are more cramped in the narrow "flotze," and therefore the strain to them is greater. The unfavourable cases are in nervous, weak individuals.

Chapter III. deals very completely with the pathology and etiology of the affection, and observers in all lands, he says, agree that nystagmus exists especially in those workers that are employed as hewers. His account of the mode of work required of the miner in Germany accords very closely with that with which we have been made familiar in England by the writings of Snell, and in France by Dransart. He is also very distinct in asserting that the miner as he pursues his work underneath the coal (holing) does direct his eyes upwards and obliquely, and he supports this, moreover, by interesting observations on the physiology of the eye movements and the ways in which the muscles are attached to the globe. The eyes are continually moved right and left, but always upwards until the man has completed his work in the hole. If it is considered that this work is pursued for eight hours with only short intervals for meals it can be imagined to what continued use the elevators of the globe of the coal getters are put, and further, the passages are so narrow, and roofs so low, that in coming to his work the miner has to walk with back bent and head thrown back to avoid knocking himself, and additional strain is thus caused to the elevators.

The author holds that any disease that weakens the body is a predisposing cause to nystagmus. Next to the prime cause found in the tiring of the elevator muscles occasioned by the position assumed at work, Nieden holds that the kind of light used in the workings has an important place, and he has found nystagmus more frequent in the worst lighted pits or in those in which safety lamps were used than in the better lighted mines or those in which open lights were employed. He gives in considerable detail the results of his examination of these mines, but in all he found it was the hewers that were attacked. He enters into a comparison as to the light given by open lamps and the various safety lamps, which do not, however, differ from those with which we have been made familiar in England. He regards the disease as a neuro-paretic affection—a paresis of muscle tonus. There are many other interesting matters discussed in this chapter that we must pass over.

The following propositions complete this chapter:

(1) That nystagmus is confined to those miners who are compelled to work not only with their eyes turned upwards but with their heads in a strained posture. (2) That the absence and extreme rarity of ocular muscle affections among painters, masons, &c., makes it probable that nystagmus occurs sooner and in a more intense form among miners (because of the insufficient light) than it would do if they worked with a good light. (3) Just as a bad light is a predisposing cause, so defects in the perception of light increase the strain on the muscles. (4) General bodily weakness may in the same way be a factor in the causation.

The last chapter is devoted to a consideration of the treatment of this affection. As the result of his nineteen years' observation, Nieden is of opinion that each case can be cured by suitable treatment, though under some circumstances it may have to be carried out for a considerable time. In this he says he agrees with Dransart, Snell, and Romiée, who give an equally favourable prognosis.

Of the first importance to recovery is the removal of the conditions which are hurtful and which originally caused the disorder. Thus he advises cessation of the work of the hewers with the tired upward direction of the eyes, and also advocates working by daylight or improved artificial light, and the providing of good food. Rest, he thinks—which means rest from exerting the elevator muscles—is able, without anything else, to bring about the abolition of the abnormal ocular movements, and especially when employment can be continued by daylight or electric light. He considers giving up the hurtful work a *sine quâ non* for cure. The results are more favourable when it is possible to lessen the strain on the elevators by carrying on the work in a better light. He discusses various medicinal and other modes of treatment, including galvanism and suspension. The internal remedy he speaks most highly of is strychnine.

We have preferred to summarise the author's observations as presented in the volume before us rather than be critical. If we now assume the latter character at all it will be merely to say that for English readers the work would have gained in interest if there had been less repetition and if the style had been less diffuse. Our survey will, however, abundantly show the care with which the author has treated his subject and the exhaustive manner in which he has dealt with it. It is a most important addition to our knowledge of this ailment of miners, and those interested in the subject will find it a work of great value.

H. SATTLER (Leipzig). On the Existence of an External Accommodation due to Muscular Pressure. *Graefe's Arch., vol. xl., part* 3.

In 1886 Schneller surprised the ophthalmological world with the assertion that the amplitude of accommodation increases with the convergence and lowering of the eyes, which increase he attributed to the lengthening of the ocular axis by muscle pressure. This was a revival, in part, of the old theory of Arlt, which found supporters such as Heule, Listing, and Bonnet, to disprove which it took the exact researches of Helmholtz, Knapp and Donders. In 1872 Foerster revived the question of accommodation in aphakia, bringing Donders and his school against him, and their researches on vision in diffusion circles.

Schneller has found his opponent in Sattler, who has taken great pains to point out Schneller's mistakes in an exact and scientific manner. Schneller has neglected, says Sattler, the sources of error pointed out as long ago as 1801 by Thomas Young in his classical treatise, "On the Mechanism of the Eye." He also takes Schneller to task for his choice of subjects: "with the exception of one aphakic subject, a more unfortunate selection for proving such a subtle question could not have been made." Schneller's method of testing was to take Schweigger test types, 0.3, or still smaller print, and to bring it to the punctum proximum of one eye directed straight forwards. During this time the other, closed eye, was pressed at the inner canthus to prevent movements of convergence as much as possible. The distance of the type from the nodal point of the eye was then measured as accurately as possible. The test was then repeated with unimpeded convergence in the horizontal plane, and again with the eyes directed downwards "as far as comfort would permit," and in some cases with the eyes directed upwards. Sattler thinks this method may be "very simple," but open to errors of all sorts. Schneller himself was forced to admit this, and accordingly repeated his experiments with an apparatus similar to that used by Donders for determining the relative range of accommodation. But even with this he neglected so many precautions, and allowed so many errors to creep in, that his results were entirely vitiated.

To get exact data Sattler had an instrument constructed under Hering's directions. The principles kept in view were:—

(1) When examining with parallel axes the haploscopic fusion of two identical images presented to both eyes is the only absolute guarantee that convergence has been entirely excluded. To attempt to control parallelism of the visual axes by ocular inspection, even when the angle gamma has been previously measured, is impossible. While experimenting with haploscopic fusion the eyes often seemed to diverge, and in other cases, where there was a constant tendency to separation of the fused images, the eye could not detect any noticeable deviation from parallelism of the visual axes. When haploscopic fusion has taken place the image is very well defined, and seems a little larger.

(2) The apparatus must be so constructed that the distance between the optical centres of the correcting lenses necessary in most cases and the test types is equal to the pupillary distance when examining with parallel axes, and furthermore, the visual axes must be perpendicular to the

lenses and the test cards in all positions of the axes. The head being well fixed, and the lenses correctly placed, no further manipulation should be necessary, at the same time any movement of the head should be readily detected.

(3) The axis of revolution of the apparatus, about which the lenses and test objects revolve whenever the plane leaves the horizontal, must pass through the centres of rotation of both eyes, *i.e.*, coincide with their basal line. In Schneller's apparatus the axis of rotation is at the end opposite the face, a grievous source of error.

Sattler's apparatus may be briefly described thus. Fixed to the back of a stout chair is a strong iron rod, on which the apparatus may be raised or lowered; from this same rod a head-rest projects. The main part of the instrument is a frame shaped like a square, open in front, and at the free ends of two sides a similar piece is fitted, open downwards, and revolving freely on two pins. Projecting from the top piece are three metal strips with millimeter scale, about 75 cm. long, the middle one being fixed, the two others movable.

To these lateral strips are fixed the lens holders and the test cards, so that eye, lens, and test card are always connected by a straight line. The illumination is furnished by a small electrical lamp suspended from the central strip between eye and test card, the eye being protected from direct light by a shield. In his first experiments Sattler found that his results varied not only with different illuminations, but also with the same illumination when the plane of vision was changed.

All persons examined had the same refraction in both eyes, and vision generally was above normal. With the exception of three aphakics and the author, the subjects examined were all young medical men between 20 and 27 years old, and most of them myopic (1·25 D. to 4·5 D.), when fully atropised. The aphakics were 18, 35, and 46, the author 42 years old. Myopes of 4 D. were examined at their punctum remotum, the others corrected to between 16 and 20 cm. In some cases as many as 80 observations were made. At first the test objects were placed at that distance on the horizontal and parallel strips where haploscopic fusion might be expected. When this had been attained, both objects were moved backwards or forwards exactly the same distance, and the points noted at which the test objects were clearly seen. Each time the objects were moved the person examined was instructed to close his eyes, not alone to prevent fatigue of the retina, but also to prevent his judgment being biassed. The observations with convergent visual axes were taken in the same way.

The range of clear vision varied with the persons from 1·5 cm., and less, to 4·2 cm. The aphakics had a range of 4·2—4·7 cm. From the distances at which the objects were clearly seen, the mean was taken, and this expressed in dioptres.

As a result of his experiments, Sattler positively asserts that when internal accommodation is fully excluded, no increase in refraction worth considering was brought about by converging or lowering the visual axes. In his second series of experiments Schneller was more guarded as to his results: "In young people and myopes there is sometimes an increase in refraction for near vision and for looking downwards." Schneller examined younger people than Sattler (12—19 years), and used higher degrees of convergence, but he did not lower the visual plane as much. Sattler, therefore, denies that Schneller has proved any elongation of the globe in the sagittal axis under the conditions mentioned, and that furthermore his endeavours to reconcile Förster's asserted accommodation in aphakia with Donders' proof of the contrary are entirely in vain.

Here are some of Sattler's results:—

Dr. B., aged 23, M. 3·5 D., V. $\frac{6}{v}$, examined after complete atropinisation with + 2 D. Test object, a cocoon thread stretched vertically across a white field. Tried first with parallel axes and haplascopic fusion, the thread was seen between 16 and 21 cm., well seen between 17 and 19·8 cm. With convergent axes it was recognised between 12 and 24 cm., and clearly seen between 16·8 and 19·8 cm. Lowering the axes 30° it was recognised between 26·2 and 11·2 cm., well seen between 16·6 and 20·5 cm. The mean of the distances at which it was clearly seen with parallel axes was 18·64 cm. (= 5·36 D.), with convergent horizontal axes 18·67 cm. (= 5·35 D.), with convergent lowered axes 18·35 cm. (= 5·45 D.) The extreme difference, therefore, between parallel horizontal and convergent lowered axes was 0·09 D. Tried again with test-types (French Jaeger), the ranges were much smaller, and the extreme difference 0·008 D.

Dr. D., aged 24, M. 4·5 D., V. $> \frac{6}{6}$, tested, when fully atropised, with + 1·5 D., test type: at 17 cm. the type is clear, at 16·8 cm. quite clear. Lowered 30°, retaining haploscopic fusion, a trifle clearer. Returning to horizontal plane, the same. Raised 15°, reading is not so agreeable. Lowered 30° below horizontal, "The type seems a little clearer and appears to have moved a little further away."

In the horizontal again: 16 cm., not as clear; 15·2 cm., not legible; 16·3 cm., clearer; 16·6 cm., quite clear; 16·9 cm., the same; 17·5 cm., not clear; 17 cm., clear again; 16·7 cm., the same; raised 15°, a little less clear; horizontal again, clearer again; convergent axes, horizontal plane; 16·7 cm., very clear; 16·2., less clear; 15 cm., not clear; 16·8 cm., very clear; raised 20° cm., the same; lowered 30° below horizontal, rather better; 16·3 cm., not as clear, &c.

With parallel axes the mean distance of clear vision was 16·75 cm. (= 5·97 D.), with convergent axes 16·62 cm. (6·016 D.), giving an extreme difference of 0·46 D. Raising or lowering the visual plane made no difference.

In ten other cases the difference was expressed by the second, in two by the third decimal. In one case it was 0·16 D. (an amount which Schneller would call equal to 0), and in this case Sattler suspects that the eye and correcting lens did not remain constant.

An aphakic girl, aged 18 (with + 9 Sn. VI. almost with + 13 Jaeger 1 well with R., slowly with L.), was examined with + 13. Separately tried, the strips being parallel, the vision of R. was clearest at 22·8 cm., that of L. at 22·2 cm. Haploscopic fusion could be attained with difficulty for a short time; the type was easily read at 22·5 cm. With convergent horizontal strips 22·3 cm. (= 447 D.) was the mean, and, with the plane lowered 30° to 40°, 21·8 cm. (= 4·58 D.), the extreme difference, therefore, 0·14 D.

Schneller believes that the elasticity of the sclera, which permits changes in the axial length of the bulbus, diminishes with age, and finally disappears altogether, at any rate as far as the action of muscular pressure is concerned. This has led Sattler to make a number of researches, the results of which he promises to give us later.

The key to the whole question seems to lie in the vision in diffusion circles, a subject to which Salzmann has recently contributed a very valuable paper (Graefe's *Archiv*, vol. xxxix., part 2.).

M. W. FREDRICK.

LEOPOLD MÜLLER (Vienna). Is Lenticonus due to an Anomaly of the Posterior Surface of the Lens? *Klinische Monatsblätter für Augenheilk, June*, 1894.

In 1874, Webster applied the name lenticonus to an abnormal curvature of the anterior surface of the lens, which was easily seen by focal illumination, and was very similar to keratoconus. As in keratoconus, the anomaly is bilateral. It could not be ascertained whether the condition was congenital or acquired, but the author is disposed to accept as probable the late development of a pathological process in the lens. A second, quite similar case of Placido, is said to have developed slowly during the patient's youth. A third case of Venneman is really not lenticonus anterior, but lenticonus posterior, which latter condition is the subject of the author's paper.

To the ten cases known in literature he adds two:—

(1) (his own), J. S., student, aged 18.

R. V. $\frac{6}{36}$, not improved. Sn. 2·25 at 25 cm.

L. V. $\frac{6}{6}$? 1D.H.M. Sn. 0·5 at 15 to 34 cm.

No history of rickets, convulsions, eye-disease nor squint. Weakness of R. noticed casually seven years ago; comes now because eyes tire after reading or writing any length of time. An ophthalmometric examination (with Kagenaar's instrument), reveals no corneal astigmatism, not even under wide excursions from the primary position, nor is there any change in the value of the radius of curvature.

On examining the media with a plane mirror the author discovered that a dark, sharply contoured disc in the middle of the illuminated pupil was not caused by an opacity in the lens, but was a shadow phenomenon; for when he turned the mirror the disc contained an illuminated (red) sector, whose apex lay about at the centre of the pupil, with its base corresponding to the edge of the dark disc. Rotating the mirror caused the sector to change its place; this it did, not by disappearing and reappearing, but by gliding round. With slow movements of the mirror the sector could be made to rotate quickly on its apex, and while doing this it readily changed its direction. Ophthalmoscopic examination by the indirect method revealed nothing abnormal in the fundus. By the direct method the fundus was clearly seen without a correcting glass. There was therefore E., but only a small part of the O. D. was visible at one time; this, however, was very clearly seen.

The corneal reflex showed no abnormality. Examination of the lens reflexes under homatropin: the posterior lens reflex showed constancy in size and regularity in movement (of course small differences might easily escape detection). The anterior lens reflex seemed to increase very fast in size, and to grow disproportionately long as it moved from the centre to the periphery of the lens.

Professor Exner confirmed the author's observations after examining the anterior lens reflex with a concave mirror and Drumont's limelight; he also found that at the lens-pole the anterior lens reflex was smaller than the corneal reflex.

With dilated pupil the phenomena already mentioned were still more evident. The dark disc was surrounded by a brilliant ring, and rotation of the mirror produced the sector, which was never as bright as the ring. Retinoscopy furnishes a method of quickly detecting this condition. If the observer, while rotating the mirror quickly, changes the direction, he gains the impression that the centre of the pupil is occupied by a glass disc. Turning the (plane) mirror slowly causes the shadow to travel in an opposite direction in the periphery, and in the same direction in the middle of the pupil (not as in H. or E., but so that the upper part of the central zone becomes dark at once, and grows light again as the rotation of the mirror proceeds). There was, therefore, H. at the centre, M. at the periphery. Estimated by the direct method there was E. at the centre, — 2·5 D. at the periphery; in neither case was any astigmatic distortion present. The author therefore concludes that within a central area 4 mm. wide, the refractive power of the lens was 2·5 less than outside of this area. What makes this difference all the more striking, is that in all probability there was present an abnormal convexity of the anterior lens surface, which should produce the opposite effect.

The parallactic displacement of this abnormal central part of the lens relatively to the pupillary margin and to the corneal reflex makes the author think it probable that the phenomena are caused by the nuclear portion of the lens, possibly by the posterior portion, but by no means by the anterior lens surface.

L., with the exception of slightly diminished V., normal.

(2) Dr. Salzmann's case, girl, aged 10.

R. V. c̄ + 2 D. cyl. ax. vert. ⁀ + 1·25 D. sph. $\frac{6}{8}$?

L. V. c̄ — 9 D. $\frac{6}{36}$, 3 D. of astigmatism.

L., externally normal, shows, a little out and down from the posterior pole of the lens, a grey opacity in the form of a short-armed T made up of short irregular striæ, and easily seen by focal illumination. Surrounding this is an almost circular area which appears brighter than the periphery when the pupil is uniformly illuminated. Retinoscopy with the plane mirror produces shadows going in the same direction as the mirror in the periphery, and strongly against in the area just described. The fundus can be seen through the periphery with — 4, through the area with — 13; in the latter case only a small portion of the fundus can be seen at one time, and that much less distinctly than through the periphery of the lens. The posterior lens reflex is much smaller in the area than in the periphery. The fundus is normal, with the exception of a wide staphyloma outwards. In a lengthy footnote the author computes the relation between the curvature radius of the general posterior lens surface and that of the lenticonus, and finds it to be 6·36.

In view of the fact that only ten cases of lenticonus posterior are known in literature, the author concludes that the condition (in an appreciable degree), is a very rare one, especially as the now much-practised retinoscopy quickly reveals its presence.

The author could not find the particulars of Week's case; this leaves him eleven cases for analysis, which he divides into two groups:—

(1) The five cases (Meyer, Eiseck, Mittvalsky, Güllstrand, Salzmann), with opacities in the lens, and in Meyer's case with remains of the hyaloid artery adherent to the lens. The opacity is either at the posterior pole, or eccentric, and not confined to the more highly refracting area. This area is always definitely contoured. All but Eiseck, who neglected this point, assume an excavation of the posterior lens surface on account of the action of the posterior lens reflex. All five cases are unilateral, the other eye being normal. This, and other reasons not mentioned, make it highly probable to the author that the condition was congenital.

(2) The six cases (Knapp, Venneman, Doyne, Hart-

ridge, Knaggs, and the author's), without lenticular opacities, in four of which the condition is bilateral. Four patients are under 24, one 65, one 70 years of age. In the author's case only are the lens reflexes spoken of. In the other five cases, refraction at the centre is 5 to 11 D. higher than at the periphery. In Knapp's case there is a good deal of parallactic displacement between the central disc and the corneal reflex. In Knaggs' (patient aged 65), and Doyne's cases, the condition is said to have developed during a few years previous to the examination. In the other cases it cannot be ascertained whether the condition is congenital or acquired, and in no case has a second examination been made after a long time.

The author prefers to assume an abnormal structure of the lens nucleus, rather than a change of curvature for this second class of cases. Meyer (probably inspired by Becker) explains the condition as due to a softening of the lens capsule. Knaggs, in support of this theory, pretends that the centre of the capsule would yield more readily than the peripheral parts which are strengthened by fusion with the zonula fibres (?) Posterior polar cataract, when present, is looked upon as of predisposing moment, but the author does not consider it an explanation of the first group, and in the second group there was none.

The writer thinks that an abnormal curvature of the posterior lens surface will explain all the cases of the first group. Furthermore, as these cases are all congenital, he excludes softening of the lens capsule, and assumes an abnormal development of the lens structure. The condition arises at a time when the lens, surrounded by a vascular membrane, is influenced by the position and development of the adjacent parts; the non-vascular lens capsule (the posterior part, at any rate), is not formed at birth.

For the second group of cases the author excludes abnormal curvature of the lens surfaces, and anomaly of the refraction index for all but possibly his own case, his being the only case in which the refraction was lower at the centre than at the periphery. For the others he supposes that the nucleus was too thick antero-posteriorly (central M.), or too thin (central H.). In the first case the nucleus would have the shape of a thick disc with almost spherical surfaces, in the second case of a thin disc. His own case might be explained by an anomaly of the refraction index, by assuming that the refractive power of the lens fibres increases from the edge up to a certain layer, and from there on either remains stationary or decreases, so that the layers of highest refractive power would have an intermediate position. However, he prefers to explain his case also by the theory of anomaly of the nucleus; either the lens fibres are thicker at the poles than at the equator, in which case the anterior lens surface would be more convex, or they are thinner, giving the flat nucleus.

The author proposes as a non-committal term the name "lens with double focus," and suggests abandoning the name lenticonus.

M. W. FREDRICK.

SHERRINGTON (London). Experimental Note on two Movements of the Eyes. *Journ. of Physiol., vol. xvii., part* 1.

The following results obtained experimentally in the monkey are of value in relation to clinical observation in cases of ocular muscle paralysis in man. In the monkey, as in the human species, the optic axes are parallel. If the third and fourth cranial nerves on the left side have been severed, leaving the *rectus externus* the only non-paralysed muscle, appropriate stimulation of the *cortex cerebri* gives rise to conjugate movement of both eyes towards the opposite (right) side, the left eye, however, travelling only as far as the median line. Inhibition of the tonus and of the active contraction of the rectus externus can thus be elicited from the cortex, and from that portion of the cortex which, on excitation, gives conjugate lateral deviation of the eyes. Further experiment showed that this arrest of action, in many instances at least, can be elicited from sub-cortical portions of the cerebrum. Sherrington was able to show in two cases that this inhibition of tonus occurs in volitional lateral movement of the eyes, though less perfectly than under experimental excitation. In these two animals the *left* third and fourth nerves were divided, and after complete recovery from the operation the following observations were made. When the gaze was attracted to an object (food) held level with the eyes, and to the *right* of the mid line, the left eye looked straight forwards, the right looked to the right. If the object was then shifted more to the right or less to the right, the right eye followed it, while the left eye remained motionless, looking straight forwards. When the object was held to the *left* of the mid line both eyes were directed to it, apparently quite accurately. When the object was moved further to the left, both eyes followed it with a steady conjugate movement. When the object was carried from the left hand limit of the field back toward the median plane, both eyes followed it as accurately as before. If the object was moved suddenly from the extreme left hand edge of the field up to the median plane, both eyes immediately, and apparently with equal rapidity, reverted to parallelism with that plane; or if the object was brought from the left edge of the field to a point between that and the median plane, both eyes at once shifted apparently equally quickly to the position necessary to fix the object. These actions must mean that relaxation of the *rectus externus* of the left eye kept accurate time and step with contraction of the *rectus externus* of the right eye. The action of the left *rectus externus* gives presumably a faithful picture of a synchronous process going forward in the right *rectus internus.*

It seems clear from the above that the inhibition of the tonus of a muscle which can be elicited by excitation of the *cortex cerebri* and underlying white matter, is fully and habitually exercised in volitional eye movements.

In order that from simple relaxation of a rectus muscle the eye may return from a direction of deviation to the primary position, its setting in the orbit must be such that the tensions of its connections, apart from those of its extrinsic muscles, are in equilibrium only when the globe is in the primary position. This can easily be shown to be the case. After division of third, fourth, and sixth nerves, the eyeball assumes the primary position. If the globe be then rotated by finger or forceps in any direction, considerable resistance is felt, and on letting go the eye at once returns to the primary position. In the early stage of chloroform narcosis in the monkey, the eyes usually deviate upward and outward; when narcosis is profound they revert to parallelism. If then rotated by the finger they at once swing into the median position again. The same conditions can be shown immediately after death before rigor mortis has set in.

J. B. L.

THREE CASES OF STRABISMUS, WITH ANOMALOUS DIPLOPIA. AN ORIGINAL AND AN ACQUIRED FIXATION SPOT IN THE SAME EYE.[1]

BY CHARLES HERMON THOMAS, M.D.PHIL.

THE development in certain cases of strabismus in the squinting eye of a spot to a great extent " identical " with the macula lutea of the straight eye, has been described by Swanzy, Berry and others. In the cases here presented attention is asked to the existence of two fixation spots in the deviating eye—one the normal macula, used in monocular fixation only, and the other an acquired fixation spot, to which reference is made by the patient in binocular fixation only.

The first two cases were divergent strabismus, and were studied with me by my friend, Dr. Edward Jackson, before and after operation; the third was a case of convergent squint. All of them were treated by operation, successfully as regards cosmetic effect, but in none was orthophoria attained. In none, it may be added, did the ophthalmoscope reveal anything characteristic of the condition under consideration.

E. M. F., a girl, aged 11 years, referred to me by Dr. W. H. H. Githens. Vision: R. and L. = $\frac{6}{6}$ H. = ·50 D.;

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[1] Read before the American Ophthalmological Society.

Ophthal. Review, Vol. XIII., No. 155, Sept., 1894.

marked intermittent divergent strabismus ; generally fixes with the right eye, but occasionally with the left ; is able to keep up binocular fixation for a considerable time. With the eyes in a position of *divergence*, under a light red glass there is *homonymous diplopia*, requiring prisms 10° with their bases out to correct. Prisms aggregating 35° with their bases in arrest movements of recovery under the cover test—not complete cessation of all movement, but rather an irregular vibratory movement from side to side, lasting a few seconds, and aptly termed by my associate, Dr. Schneideman, a "search" movement. With vertical prisms, and also with red glass, the *eyes remaining in apparent divergence*, responses as to the character of the diplopia are contradictory, changing from homonymous to heteronymous. P. P. of convergence four inches ; apparent binocular fixation while reading ; squint equals 25° to 30° prism measure.

Tenotomy of left externus complete. Result : abolition of deformity, but there remained recovery from divergence neutralised by prism 17° base in, and diplopia, as produced by red glass, is crossed, requiring prisms of like strength to correct.

The strabismus being no longer manifest, and in its latency giving no discomfort, by wish of the patient further operation was postponed.

The alternating responses, as to the character of the diplopia, showed that the patient was referring at one instant to the macula and at another to the false fixation spot, thus proving that the latter had not become predominant. After the operation the macula was alone referred to, and the false spot abandoned, as was shown by the agreement between the responses of the patient and the position of the eye.

C. E. H., aged 14, male. Vision : R. $\frac{6}{8}$, and L. $\frac{6}{20}$; emmetropic ; has divergent strabismus ; fixes with the right eye, but, on covering this eye, fixes centrally with the left, and can continue such fixation for a time after removing the cover from before the right eye, which meantime remains in divergence.

Tenotomy, left externus completely divided. Result: lessened divergence, but it is still marked under cover test, notwithstanding which he now has *homonymous diplopia.* Three days later the condition of divergence under cover continued, except at the outer limit of the field of fixation on the left side—the side of the severed tendon—where there is recovery from convergence under the cover test. The diplopia has disappeared except at the outer limit of left field, where it is homonymous. With the red glass, however, there is homonymous diplopia over the entire field. Though there is manifest *divergence*, the vertical prism test shows the diplopia commonly associated with 7° *esophoria.*

At a subsequent examination divergence continued, requiring prisms of 14° base in to abolish visible recovery under the cover test. At the same time, prisms base in—even 2° or 3°—produced homonymous diplopia, making it plain that further correction of the exotropia would result in constant diplopia, and therefore, that the attainment of perfect parallelism was impracticable.

It may be thought that an attempt ought to have been made by perfect adjustment of the muscular balance to compel the use of the normal macula, to the entire exclusion of the false fixation spot. But the immediate effect of further correction, as shown by the use of prisms base in, would have been the production of an annoying diplopia. This might or might not have been overcome in time by education, the probability of the occurrence of such a result under all the circumstances involved being to my mind unfavourable.

E. P. C., aged 30; bank clerk; Vision: = R. $\frac{6}{10}$; L. $\frac{6}{6}$; wearing low hyperopic correction. Has convergent strabismus, very marked; left eye deviating. Tenotomy, left internus, complete section; left externus advanced. Immediate result, improvement in degree of strabismus; manifest limitation of movement inward with left eye.

Two weeks later, convergent strabismus of considerable amount remains; large recovery from *convergence* under cover test, but shows the diplopia for *exophoria* 20° with the Maddox rod-test, and with prisms 20° base in there is wide crossed diplopia. With prisms 20° base out, movement of recovery is abolished, and a search movement is seen, about equal in either direction.

Tenotomy of right internus, complete section. Result, abolition of apparent strabismus, slight recovery from divergence under cover test (6°) and wide crossed diplopia (30°) under red glass test. The left eye being amblyopic and never having participated in binocular vision, the patient is not annoyed by diplopia, which, indeed, can only be elicited under special conditions.

Thus, following operation of the eyes in convergence to the amount of 20°, there was at the same time present an exophoria of a like amount. The correction of this exophoria by prisms base in, instead of giving single vision, as was naturally to be expected from it, resulted in crossed diplopia. The operation, by giving to the eyes a position more nearly parallel than they had formerly held, disarranged the relation of the two retinæ to one another with the results here seen. Here again the association of convergence with exophoria is seen, and is only explicable by the assumption of an acquired fixation spot in addition to the normal macula.

In all these cases when either eye was used alone, the seeing eye was directed centrally, *i.e.*, either used alone fixed with the normal macula. On the other hand, when the two eyes were used simultaneously the diplopia, if noticed, was seen to relate to the acquired fixation spot. This was particularly true of the latter two cases. In the first case the alternating character of the diplopia showed that the patient could refer indifferently either to the macula or to the acquired spot.

In view of the conditions present in the cases here described, the following inferences appear to be justified :—

(1) Binocular vision involves an additional cerebral

function above and beyond that involved in monocular vision.

(2) Corresponding points of the two retinæ are in binocular fusion correlated with the functional fixation spot, whether that spot lies in the normal fovea centralis or not.

(3) Suppression of the macular image during the act of binocular vision may take place, the image upon the false fixation spot only being regarded while the macular image has its usual predominance when the eye is used alone, *i.e.*, the false fixation spot has now no greater prominence than a similar region of the retina in a normal eye.

(4) The existence of an additional fixation spot in strabismus is denoted when the affected eye used alone is seen to fix centrally, and yet when with prisms corrective of the deviation, as shown by the abolition of movement under the cover test, there occurs diplopia contrary to the rule, *i.e.*, crossed diplopia associated with convergence and *vice versâ.*

It will be seen that practical considerations of importance, bearing upon the operative treatment of strabismus, grow out of a recognition of the presence of two fixation spots in the same eye.

CELLULITIS FOLLOWING MULES' OPERATION.[1]

By Sydney Stephenson, F.R.C.S.Edin.

From a scientific standpoint, the record of a failure is often not less important than that of a success—a truism that specially applies to surgical procedures which are still *sub judice.* Mules' operation has been before the profession for nearly ten years, yet great differences of opinion still exist as to its value. The main object of the present communication is to elicit from members their views as to the advantages of evisceration of the eyeball and their experiences as to its disasters. I may preface my remarks by saying that the case to be narrated is the only one out of a series of thirty in which the operation has, in my own practice, been followed by an untoward result.

G. L., 10 years of age, became an inmate of the Ophthalmic School at Hanwell towards the latter end of 1891. Six years previously his left eye had been accidentally cut by a companion, and since then had been subject to periodical attacks of redness and of pain. The condition of the eye may be summed up in a few words. Perception of light doubtful. T.—1. The cornea was crossed by a cicatrix, which engaged the iris, and extended for three millimetres into the neighbouring sclera. No trace of a pupil was present, and the eye was tender and readily irritated by slight causes, such as exposure to light.

On January 7, 1892, evisceration of the eyeball was performed under ether. A small glass sphere was introduced into the scleral cavity, and the wound closed by three sutures of fine China twist inserted in a vertical direction. The operation was done with the ordinary antiseptic precautions. A light dressing of iodoform and boric acid ointment was applied to the lids.

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[1] Read at the Annual Meeting of the British Medical Association, held at Bristol, July, 1894.

During the course of the two following days, reaction was marked by the usual signs, viz., slight rise of temperature, pain in eye, swelling of the lids, and a certain amount of chemosis. The patient slept fairly, and ate well.

On January 11, the chemosis had increased markedly, and formed a yellowish fold, flecked with hæmorrhagic points. Some small white vesicles were observed upon the skin of the lids, the nature of which was doubtful. Iodoform was, however, discontinued. On January 13 it was noted that the left preauricular gland had become swollen and tender. The chemosis was more extensive and its appearance roughly resembled a tomato protruding from the palpebral fissure. On this date, numerous punctures with a narrow blade were made into the swelling, and were then followed by iced applications. On the next day—that is, a week after evisceration—it was found that the stitches had given way, thus exposing the glass sphere to view. The latter was therefore removed, together with the sutures, and the scleral cavity was douched out with a tepid sublimate solution (1 in 5000). Notwithstanding this measure, chemosis continued to increase, and by January 20, a lake-coloured fold of conjunctiva lay on the cheek, and measured 40 mm. by 15mm.

My experience of the operation having furnished me with nothing parallel to the foregoing symptoms, I wrote to Dr. Mules, who advised that the eye should not be bandaged, and that the patient should be allowed to go about armed with a pair of protective goggles. Further, that lead lotion should be used three or four times in the course of the twenty-four hours.

Dr. Mules' recommendations with regard to treatment were put into force on January 22, that is, fifteen days after the operation. By February 6, the chemosis had become so far reduced as to permit the intermarginal space of the lower lid to be seen in almost its entire extent. Palpation showed that at this period a small, hard mass, slightly tender to the touch, lay in the depths of the orbit. On February 24, the conjunctival protrusion measured 25 mm. by 10 mm., and could be seen to arise almost wholly from the lower lid.

To shorten my story, the chemosis, after undergoing some trifling diminution, reached a stationary condition; a small button of granulation-tissue sprouted from the operation wound; and the nodule, already noted as occupying the orbit, remained without alteration. This state of things continued for ninety-three days after operation, when further steps were deemed necessary. Accordingly, ether was administered, and the orbital stump was removed by dissection, during which operation a small quantity of fat was unavoidably taken away. It was observed that the muscles attached to the mass were hypertrophied, a remark that also applied to the optic nerve.

Eight months after the second operation, the following notes were made: The left orbit is occupied by some seven folds of pale conjunctiva, which radiate from a central point, not unlike the spokes of a wheel. With a single exception, the furrows between adjacent folds are not deep.

The patient was last seen about five months ago, *i.e.*, upwards of two years after the performance of evisceration. The conjunctiva was then a good deal thickened, and disposed in a bunch-like way. An artificial eye had been introduced on more than one occasion, but its use was ultimately abandoned, since it caused irritation of the stump, as shown by discomfort, redness, and discharge.

Mr. John Griffith, Pathologist to the Royal Westminster Ophthalmic Hospital, was good enough to examine the stump removed at the second operation, and this was his report:—

"(*a*) *Macroscopic appearances.*—To the naked eye and to the sense of touch, the mass presented a very irregular nodular look. A button-like granulation sprouted from its anterior aspect, and the optic nerve entering it posteriorly was apparently enlarged. The soft tissues around the hard and nodular stump were constituted by the muscular, tendinous, and fascial structures of the neighbourhood. The irregular outline of the thickened sclera could be readily distinguished on section.

"(*b*) *Microscopic appearances.*—The structural tissues of the stump are mainly fibro-cellular. The sclera has undergone extensive hyperplastic changes, and is about five millimetres in thickness. The increase is mainly due to the organisation of inflammatory material, and many fibroblastic cells are still present in the meshes of the fibrous matrix. The stone-like nature of the stump is accounted for by the fibrous condition of the hypertrophied sclera. The cavity of the latter contains fibro-cellular material, arranged in open meshwork, and showing many large vascular channels. There is an almost complete absence of pigment cells, of which, however, a few may be recognised near the entrance of the optic nerve. The nerve, although quite distinct, is undergoing an extensive metamorphosis. Its axis-cylinders are not to be distinguished, and its fibrous reticulum is denser and more cellular than normal. The granulation button is composed of loose fibro-cellular tissue. The facial and tendinous structures that surround the stump are thickened. Since no sections show muscular bundles, the latter have probably been trimmed away in preparing the specimen for the microscope."

To explain the foregoing case one is bound, I think, to assume the existence of a septic infection, passing by the perforating veins of the sclera into the tissues of the orbit, and there setting up inflammation. It is not impossible that septic changes were present prior to operating; that the altered nutrient and other conditions brought about by surgical interference roused into activity germs that had long lain dormant in the tissues—in other words, that organisms had been introduced into the interior of the eyeball by the accident six years before. The alternative theory, that infection occurred during operation, must of course be carefully considered.

I would repeat, however, that the details of operation and the antiseptic precautions were, in this case, absolutely identical with those in twenty-nine others that did well.

A CASE OF PROBABLE DISEASE OF THE LENTICULAR GANGLION.[1]

By S. Johnson Taylor, M.B.

Nearly two years ago an able practitioner and good observer in Norwich asked me to see what he had diagnosed as a case of glaucoma. He stated that at the onset the globe was congested, the pupil dilated, the tension distinctly increased, and the vision somewhat misty. There was pain in the eye or its neighbourhood, and the eyeball was certainly proptosed—a symptom not met with in ordinary glaucoma. He had wisely used eserine in the hope of reducing the tension.

I saw the patient several weeks later, in September, 1892. She was a woman aged 49, whose vision in the left (affected) eye had improved since the onset of the attack, and with – 16 D. sph. was $= \frac{5}{12}$ (partly), that of the right with $\frac{-12 \text{ D. sph.}}{-3{\cdot}5 \text{ D. cyl.}}$ being $= \frac{5}{18}$ (3 letters). The right pupil measured 3—3·5 mm., was active to direct and indirect light and with convergence; the left pupil measured 4—4½ mm. and was immobile to light, both direct and indirect, and with convergence.

The movements and tension of each eye were normal, and there was no proptosis of either. She read with the right eye 1 J. at $3\frac{1}{2}$ inches; the same with the left at 3 inches. It is unfortunate that the high myopia rendered useless any examination of her accommodation, as, theoretically, in affections of the lenticular ganglion the ciliary muscle should be affected.

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[1] Read at the Annual Meeting of the British Medical Association, held at Bristol, July, 1894.

In each eye the ophthalmoscope revealed a medium-sized staphyloma surrounding the disc. In the left or affected globe there was also slight choroidal thinning and disturbance between Y. S. and O. D., and, again, on the temporal side of the Y. S. No peripheral choroiditis was observed.

Before her marriage she was strong and well; since then she has had headaches once or twice a week with vomiting. Latterly these have been less severe. She has been married twice. By her first husband, who died, aged 27, of phthisis, she had two children; both died—the eldest at $4\frac{1}{2}$ years, of scarlatina, the second, aged 7 weeks, of bronchitis. By her second husband, who had severe and persistent eczema, and is now suffering from cough and loss of flesh, she has had one child and a miscarriage at 3 months; the child died aged 23 months, of scarlatina. There is no history of syphilis. She used to suffer a good deal from "hysterics," and four years ago she had an affection of the right arm which was very painful and rendered powerless, so that she could not get her hand up to her head for several weeks. It was said to be neuralgia and rheumatism combined, but it appears to me to have been probably an attack of peripheral neuritis. Otherwise there is no history of rheumatism. Earlier in the year, in February or March, she had had influenza, but not badly.

Her upper teeth are lost, her lower molars are considerably decayed and worse on the left side. She was ordered liq. hydrarg. bichlor., with potas. iod., the latter in increasing doses, and later had at various times antipyrin, Easton's syrup, quinine and phenacetin.

I have watched her off and on ever since; the left pupil settled down to a fixed state of 6½ to 7 mm., and remained inactive to light and convergence for a long time; both cocaine and homatropine, alone or combined, would increase the dilatation of the pupil. On one occasion homatropine discs put in twice, dilated the pupil to 9 mm. in less than an hour; on another occasion a 2 per cent. solution of cocaine, followed in ten minutes by a cocaine disc $\frac{1}{200}$ gr., dilated the pupil in thirty minutes, from 6 mm. up to 7·5 mm., whilst a ¾ per cent. solution of eserine would contract it to $1\frac{2}{3}$ mm. in forty minutes.

The faradic current applied to the neck caused the pupil to dilate a little, viz., ½ mm., but there was no increased dilatation on pricking the skin with a pin.

She had a good deal of neuralgic pain from time to time about the eye and down the left side of the nose, but there was no loss of sensation in the skin of the neighbourhood. The patellar reflexes were, perhaps, slightly sluggish; there was no numbness in the feet or difficulty in walking or standing with the toes and heels together. Graefe's and Stellwag's signs were both absent.

On Feb. 28, 1893, I first noticed a slight alteration in the left pupil, which, though immobile to light, contracted slightly, viz., ½ mm. on convergence, from 6·5 mm. to 6 mm.,—but on several subsequent examinations I detected no action on convergence, and it was not until June 22 of this year that I again observed any action, when, though inactive to light, the left pupil contracted slowly on convergence to 4·5 mm. from 6 or 6·5 mm. The same result occurred on June 26 and July 11, the pupil still remaining immobile to light, direct and indirect, whilst the right pupil acted normally in every way.

What interpretation is to be placed upon the signs and symptoms? I think the history, the rapid onset with the associated symptoms and the progress, are much opposed to the lesion being situated in the third nerve nucleus, or any part thereof; though observed for nearly two years, the affection remains one-sided, and indications of amelioration are present in the fact of the pupil acting, though slowly, with convergence. Neither do I think any affection of the intra-ocular ganglionic cells of the choroid would explain matters, whilst, as it seems to me, an acute affection of the lenticular ganglion meets the case.

What would happen if the lenticular ganglion were rapidly placed *hors de combat?* Motor, sensory and sympathetic fibres would be interfered with. The circular fibres of the iris would be paralysed, and the accommodation would be lost, whilst the dilating fibres which receive innervation from other sympathetic sources would be partially paralysed only. Faradisation of the skin of the neck would, as in this case, cause increased dilatation.

Hence the pupil would remain dilated and inactive to light and convergence for some time, perhaps permanently, if no reparation of tissue took place. I consider, however, the fact of the pupil again acting on convergence, though slowly, points to the fact that some recovery is taking place—possibly a stronger stimulus is sent down to the pupil with the associated action than occurs in the simple light reflex—and in time, perhaps, its action to light may return also.

My interpretation of the events in this case is, that for some reason there was an attack of orbital cellulitis which caused the congestion, proptosis and—owing to the proptosis—the apparent glaucoma, and at the same time involved and more or less wrecked the lenticular ganglion, so that as soon as the results of the cellulitis had cleared up, the more permanent effects, due to the involvement of the ganglion, came into notice.

THE THERAPEUTIC VALUE OF ICE IN OPHTHALMIC SURGERY.[1]

By Angus McGillivray, M.B.

Surgeon to the Dundee Eye Institution; Ophthalmic Surgeon to the Dundee Royal Infirmary, etc.

Considering the comparative want of attention given to cold as a therapeutic agent in modern ophthalmic text books, one may infer that its beneficial effect in ocular wounds and injuries is not sufficiently recognised. Some surgeons, although admitting the remedial action of cold in inflammatory conditions, never employ it except, perhaps, on very rare occasions. Others employ it with the caution afforded to some untried remedy, afraid that at any moment its application may be attended with disastrous results, such as gangrene or deep seated inflammation. Others, again, use it either intermittently or continuously, during the first stages of inflammation, to control the process, and believe that it can only do mischief in the later stages. After an extensive use of cold in the treatment of ocular injuries I have no hesitation in stating that of all the remedies at our disposal it is undoubtedly the best. Why is it fast losing favour, and why are different results obtained by the same remedy at the hands of different surgeons? We know that drugs classified as poisons, when wrongly administered, produce deleterious results. But such drugs, when given in the proper manner, have often the most beneficial effect. No one would for a moment, I think, hesitate to prescribe strychnine as a nervine tonic, because, if taken in overdose, it becomes no longer a tonic but a poison. If cold be wrongly applied to a wound it can produce disastrous results, but that is not sufficient reason why we should discard its therapeutic influences. Cold, then, being a powerful remedy, requires careful and judicious application. How are good results obtained from its application in ocular injuries? A knowledge of the pathology of inflammation and of the pharmacology and therapeutic action of the remedy employed should guide us.

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[1] Read at the Annual Meeting of the British Medical Association, held at Bristol, July, 1894.

Inflammation has been defined as "the response of living tissue to injury." Dr. Burdon Sanderson defines it "as the succession of changes which occur in a living tissue when it is injured, provided that the injury is not of such degree as at once to destroy its structure and vitality." Whatever part of the body be affected, whether vascular or non-vascular, the pathological changes are practically the same, *e.g.*, the inflammatory changes in the cornea and sclerotic are essentially similar. "The cornea is simply a nucleated fibrous tissue with a specially free set of lymph channels in place of blood vessels; these, undoubtedly, are in communication with the sclerotic vessels at the border. Hence as the cornea depends for its nourishment on the vessels around it, it must be more or less influenced by the condition of the circulation within them" (Hamilton).

Cold, when applied to a part, contracts the small arteries and consequently diminishes its blood supply. In the early stages of inflammation the blood vessels are dilated. This affords greater facilities for the escape of the corpuscles and the liquid part of the blood. If, therefore, the blood vessels of an inflamed area can be prevented from becoming dilated, the process of diapedesis and the escape of plasma into the tissues around are limited. To prevent dilatation of the blood vessels, it is necessary that the application of cold should not only be continuous, but should be adopted as soon after the injury as possible. If applied in an intermittent manner, the periods of hyperæmia that occur during the intervals undo whatever good may have been obtained from the application.

The pain experienced in inflammation is due to "pressure upon or stretching of the terminal nerve twigs by the dilated blood vessels and the exudation" (Walsham). Besides, the peripheral endings of sensory nerves appear to become hyper-sensitive when the supply of blood to the part is increased. Cold, when applied early, prevents pain by preventing dilatation of the blood vessels and inflammatory exudation. If the effusion be already set in and pain experienced, the pain is relieved by the anodyne action of cold through its paralysing effect on the terminal branches of the cutaneous nerves (Brunton).

The beneficial effect of cold does not cease after the early stages of inflammation have been reached. It can be continued with great advantage, if necessary, all through the process, as can be proved by clinical experience.

Seeing that suppuration is the result of the action of pathogenic micro-organisms that have found access to the diseased tissues, if it be possible to arrest or even hinder their destroying function, suppuration may be prevented. Pathogenic micro-organisms develop best at about body temperature, as a rule. If the temperature of the medium in which they grow be lowered even a few degrees below that of the body generally, their vitality is not affected, but their functional activity is impaired.

During health, although surrounded by micro-organisms, we are proof against most of them, but when a part of the body is injured, the affected tissues become susceptible to the effect of micro-organisms, and their resisting power is considerably lessened. If the temperature of an injured part be reduced in such a way as not to destroy its vitality, we can hinder the growth and impair the function of the invading germs. By applying cold continuously, and thus lowering the temperature, we allow the injured tissues time to recover sufficient strength to ward off or destroy the germs, and thus suppuration is prevented. Cold, then, on account of its retarding influence on the growth of bacteria, may be regarded as an antiseptic. To discontinue its use before healing or repair is accomplished would be equivalent to discarding antiseptics in the subsequent dressings of operations which have been performed with antiseptic precautions.

It may be said that cold retards the healing process of wounds by lowering the vitality of the tissues, and that it prevents the absorption of inflammatory products, and further, that its continued use becomes a source of annoyance to the patient. Healing is not retarded in any way, absorption is not interfered with, and instead of discomfort, it has a soothing effect.

Can the temperature, *e.g.*, of the cornea, be lowered to any appreciable extent by applying cold over the closed eyelids? Michel found that by the use of an icebag, the temperature of the anterior chamber of the rabbit was reduced 13° to 15°C. (27° Fah.) His experiments were carried out by means of the thermo-electric couple. The recent experiments of Dr. Silex seem at first sight to prove that the application of ice over the closed eye. lids raises the temperature of the anterior chamber by contracting the superficial blood vessels, and thus driving the blood back into the deeper parts; but he himself admits that his results require confirmation; and further, it must not be forgotten that the ice in his experiments was applied only for a very short time.

The mode of application I advocate is as follows:— When a recent injury to the eyeball is first seen, the eye is bathed with sublimate lotion, 1 in 5,000, and then the wound is attended to. The patient is put to bed and instructed not to open his eyelids. Iced compresses are applied immediately, and continuously. If after a day or so no inflammatory reaction has set in, the compresses are laid aside. In cases attended with inflammation the application is continued till the process has subsided. Each compress is removed as soon as it begins to lose its cold feeling and a fresh one applied. Time will not permit me to read notes of cases that have made very satisfactory recoveries under the continuous use of iced compresses. Let me, however, give brief notes of one interesting case.

A. P. was injured in his left eye by a jute hook—an instrument by no means aseptic—half-an-hour before being seen. On examination the cornea was found to be cut right through into the anterior chamber. The incision passed obliquely through the centre of the cornea from a point 1 mm. from its outer margin, to a point 4 mm. beyond the inner corneo-scleral junction. The outer one-third of the iris was completely torn from its ciliary attachment up to the pupillary margin, leaving a large irregularly shaped coloboma. The remaining part of the iris was found lying against the posterior surface of the cornea. The lens seemed clear. On the outer part of the eyeball there was deep subconjunctival ecchymosis. The pain was so severe that the patient, a strong healthy man, fainted during the examination. The wound was not washed with sublimate lotion, as the patient could not bear anything to touch the eye. He was put to bed; atropine and cocaine drops three times daily and iced compresses continuously applied were ordered. In the evening the pain was almost gone. The subconjunctival ecchymosis had now completely surrounded the cornea, which became very opaque. Vision was reduced to hand movements, and then only when he looked down. On the following morning cornea was hazy and surrounded by a deep overhanging chemosis. Marked swelling and redness of the lids—in short, everything pointed to beginning suppuration of the corneal wound. There was, however, no pain to speak of, and the patient slept fairly well. These symptoms continued till the fourth day, when the cornea began to clear up slightly. On the fifth day the corneal haze cleared up sufficiently to enable me to see some hyphæma. Patient counted fingers at a few yards' distance. From the fifth day there was a gradual uninterrupted improvement. Ice discontinued on the thirteenth day. Atropine and cocaine drops continued for seven weeks, when all traces of inflammation had disappeared. Three months after injury L. V. = $\frac{6}{60}$ with —3 D. spherical = $\frac{6}{12}$. Two months later vision was tested and found to be $\frac{6}{36}$ with —3 D. spherical = $\frac{6}{9}$. Lens, fundus and media normal, and no abnormality detected except the linear leucoma of the cornea and the large coloboma of the iris. The patient was again seen eighteen months after the injury and the eye was found to be satisfactory, with vision $\frac{6}{36}$ with —3 D. spherical = $\frac{6}{9}$.

This method of treatment has given me the utmost satisfaction. If I have failed to explain its curative effect on the lines of rational therapeutics, I can confidently, from clinical experience, recommend it as a most valuable adjunct in the treatment of ocular injuries.

L. KUGEL (Sofia). On Cauterisation of the Scleral Conjunctiva. *Graefe's Archives, xl.*, 3.

The author has had a large experience of indolent forms of corneal disease, and has for years been in the habit of freely cauterising the ocular conjunctiva over the sclerotic as a means of dealing with them. He is of opinion that in many cases of chronic ulcerative keratitis of the asthenic type, the ordinary methods of treatment fail to accomplish their purpose. Either they are altogether ineffective, or they improve the condition for a time, but stop short at a point far removed from cure; or again in a third and perhaps the largest class of cases, they do eventually attain their end, but only after very prolonged or persistent use. What it takes weeks to do with the usual means, *e.g.*, astringents applied to the palpebral conjunctiva, massage, jequirity, &c., may, Kugel thinks, be attained in as many days by cauterisation of the scleral conjunctiva. He cites two typical cases in which he has resorted to this method of treatment.

The first was a man aged 30. His condition was deplorable. There was trichiasis of both sides, diffuse trachomatous infiltration, and severe pannus of each eye. The trachoma was of eight years' standing, the pannus and consequent failure of sight of four years. He could only count fingers with the right eye at two and with the left at one metre. After three months' treatment with nitrate of silver, mitigated stick and sulphate of copper used in the ordinary way, his vision somewhat improved. He could just make out large print if it were held near. A farther six weeks' continuance of the same remedies made little or no difference, and the author therefore endeavoured to increase the effect of the astringents by applying them freely to the retrotarsal fold as well as to the conjunctiva of the lid. The sight was now so much better that the patient could read Sn. 1·75 at 30 cm. with his right eye, but beyond this there was no improvement. There remained a light, parenchymatous opacity of the cornea which resisted all the ordinary modes of treatment, although they were extensively and continuously tried. Following the hint therefore afforded by the effect of applying his astringents to the retrotarsal fold, the author resolved to include the ocular conjunctiva also in his field of operations. The result was brilliant and much more rapid than he had expected. Twelve applications of the caustic were sufficient so to improve matters that with the right eye the patient obtained full vision, and with the left almost full vision (Sn. 1 at 80 cm.).

Five years have elapsed since this result was obtained, and there has been no relapse.

The second case was that of a woman, 28 years old.

In the upper and outer quadrant of the left cornea there was a deep indolent ulcer, $2\frac{1}{2}$ mm. long; in the right eye, also in the upper part of the cornea, were two more ulcers very similar to that in the left eye, but not so deep.

It is sufficient to say that for two months or more all the ordinary remedies were freely tried except jequirity, which in this case was considered too dangerous to be justifiable, without effecting the very least gain. The ocular conjunctiva was then cauterised as in the previous case, and a definite improvement at once became evident. New vessels, which in both cases the ordinarily used remedies had entirely failed to elicit, made their appearance and surrounded the affected corneal areas. After six applications there were little more than facets to be seen where previously there had been deep ulcers, but it is to be noted that the final healing of these facets was a much slower process than the earlier stages of recovery. Twelve more applications were necessary in the right eye, and twenty-five in the left before the healing was complete.

In a few cases the author has gone a step farther, and has actually cauterised the sclerotic itself by snipping the conjunctiva in one or two places over it, and passing the stick of caustic through the openings thus made on to the sclera. He has, however, abandoned this method of treatment as possessing no advantage over the other, while the disadvantages are distinctly greater. The resulting scleritis is apt to be severe, and, on two occasions, a tendency to scleral ectasia has been observed.

N. M. ML.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

Thirtieth Annual Meeting, held at Washington, 1894.

Dr. George C. Harlan, President, in the chair.

Detachment of the Retina.—Dr. C. S. Bull, New York, reported his recent experience with the different methods for the treatment of this condition, basing his conclusions upon thirty-eight cases. He found that while division of fixed opacities of the vitreous or puncture of the detached portions of the retina, using a Graefe knife and entering through a valvular opening, may do good in some cases, the largest number were benefited by rest on the back in bed. The instillation of atropine and the use of the pressure bandage upon the eye, with the internal administration of pilocarpine, sodium bicarbonate, potassium iodide, &c., gave results which he believed justified a resort to this line of treatment.

Magnet Extraction.—Dr. H. Knapp, New York, read a paper upon "The Extraction of Iron Fragments from the Vitreous with the Magnet." In a recent case, where the foreign body entered through the ciliary region and was seen in the lower part of the retina with an air bubble in the upper part of the vitreous, the patient only consented to the extraction on the fourth day, when his sight began to dim and the eye to redden. The first attempt was successful and recovery quick and perfect. In a second case the foreign body could not be seen, and all attempts at extraction proved unsuccessful. The eye was enucleated, but still the foreign body could not be found.

He recommended that the knife be thrust obliquely through the sclerotic, producing a wound canal which would be readily closed by the vitreous pressing the inner lip against the outer, thus rendering a suture unnecessary, and preventing incarceration of the vitreous with its consequences, inflammation, fan-like cords in the vitreous, and subsequent detachment of the retina. He also recommended that during the introduction and withdrawal of the magnet the wound be kept open by a sterilised curved platinum wire, preventing the foreign body from being stripped off from the tip of the magnet by the edges of the wound. He said that his experience in extracting foreign bodies from the depths of the eye had been very much less favourable than the results given by Hirschberg and Mayweg, which were good in 10 per cent. and 31 per cent. respectively.

With regard to the communications of Haab and Schlosser, stating that foreign bodies had been drawn from the depth of the eye through the vitreous, and even through the lens into the anterior chamber, by applying the eye to the broad end of a very strong magnet, whence their extraction was easy with the ordinary magnet or forceps, he thought the procedure should not only be tested in suitable cases, but also studied experimentally.

Foreign Bodies in the Orbit.—Dr. Walter B. Johnson, Paterson, N.J., reported four cases of foreign bodies in the orbital cavity. In the first a branch of a cherry tree, two and three-quarter inches in length and a quarter of an inch thick, penetrated the upper lid in the median line and remained in the orbit one week. It was then removed; there were no cerebral symptoms; inflammation subsided gradually. The vision at last examination was $\frac{6}{200}$, and slight ptosis and some divergence remained.

In the second case a splinter of pine wood two and one-eighth inches long penetrated the orbital cavity near the inner canthus, lacerating the lid and injuring the globe. There were subsequent cerebral disturbances, pan-ophthalmitis, erysipelas of the head and face, and in three weeks death. The autopsy revealed a suppurative meningitis, perforation of the brain, and an extensive fracture of the orbital plate of the frontal bone.

In a third, a boy fell upon a stick one and a quarter inches long and one-eighth of a inch across; it presented in the upper eyelid to the temple side of the median line, where it had remained two days. It was removed and the very extensive tumefaction disappeared and the eye became normal.

In the fourth case, the patient was wounded by the premature discharge of a cannon, wadded with weeds and stubble. The right eye was destroyed and shrunken. The left eye suffered an extensive choroidal rupture, and when examined forty-seven years after the injury, his vision was $\frac{10}{200}$.

Malignant Tumours of the Orbit.—Dr. George C. Harlan, Philadelphia, reported three cases. The first was an epithelial orbital tumour, originating in the lacrymal sac. The patient was a farmer, forty years of age, in good general health. His attention had been first called to the right eye by an overflow of tears eight months before his admission to the hospital. Afterwards there was a good deal of pain in the eye and temple, and the lower lid began to swell. The lower lid was protruded, and the eye was pushed upward and outward by a tumour which reached from the inner canthus to the junction of the middle and outer thirds of the lid, overlapped the orbital margin, and extended back into the orbit on the lower and inner side of the ball. It was entirely beneath the conjunctiva, which was not involved, and was solid and very hard to the touch. The nasal sinuses were free from disease. The eye suffered only from pressure and V. was $\frac{15}{200}$.

The tumour was removed through a free incision in the lid without disturbing the eyeball. It was as large as a small hen's egg, was firmly adherent at the lacrymal groove, and extended along the floor and inner wall of the orbit nearly to the optic foramen. Microscopic examination proved the growth to be an undoubted epithelioma. Three months later there was no exophthalmos and vision had increased to $\frac{15}{40}$, but a hard mass of considerable size could be felt at the inner canthus and extending back into the orbit in the position of the former tumour. The whole contents of the orbit were now removed. There was extensive destruction of the walls of the lacrymal groove, making an opening large enough to admit the end of the little finger.

The second case was a large round-celled sarcoma originating in the capsule of Tenon, and completely filling the orbital cavity. The patient, a labourer, aged 52, had suffered no inconvenience until three months before the operation.

The third was one of small round-celled sarcoma of the orbit, rapidly recurring, and attaining an enormous size, in a child 9 years of age. The disease began in August and the contents of the orbit were removed in November. The growth recurred in December, and increased with great rapidity until it was more than half as large as the child's head. There were no cerebral symptoms and no pain. Death occurred from exhaustion in April. The eyeball was not involved in the disease, but was destroyed by pressure. At the time of the operation there was no communication with neighbouring cavities, but the growth subsequently invaded the nasal sinuses and the cranial cavity.

Tumour of the Optic Nerve.—Dr. Swan M. Burnett, Washington, reported a case. A boy, aged 7 years, had left exophthalmos of three years' standing, of slow painless development, and of such extent that the posterior wall of the globe was on the level with the bridge of the nose. Movements were restricted equally in all directions. Displacement directly forward, eye blind, nerve white, retinal veins enlarged and tortuous, eye otherwise healthy. The trouble had come on soon after an attack of *la grippe*. A large, though soft, tumour was found on examination occupying the apex of the orbit, and the optic nerve, much enlarged, passed into it. The eye and the nerve attached to it were first removed, and the mass then taken out through the opening in the conjunctiva. It measured 35 by 25 by 15 mm., after hardening in absolute alcohol.

In shape, it corresponded to the form of the apex of the orbit. The tumour, which reached up to the lamina cribrosa, was confined strictly to the intervaginal space; neither the dural nor the pial sheaths being affected. The structure of the tumour was not uniform. It consisted of long fibres, which were nucleated, and short fibres, which were in a portion nucleated; spindle cells; hyaline plaques, most numerous in the tumour, and nests of large oval cells with nuclei. The walls of the vessels were frequently hyaline. A year after the removal the boy was in better health than before, and there were no signs of recurrence.

From a study of the literature, he was led to regard these tumours as all essentially of the same nature, the differences in appearances described being due to the stage of the growth or degeneration. They are not malignant.

Sarcoma of the Lid.—Dr. W. H. Wilmer, Washington, reported a case of melanotic round-celled and giant-celled sarcoma of the lid, which was found to be undergoing myxomatous degeneration. In the limited period that had elapsed since its removal there had been no signs of its recurrence.

The Halo Symptom of Glaucoma.—Dr. S. O. Richey, Washington, pointed out that the clinical characters of this symptom demonstrated that its cause must lie in front of the chiasma, and probably in front of the retina. He would locate it in the aqueous humour. Since the appearance of a halo produced by conditions outside of the eye, as around the moon, is due to minute crystals in the atmosphere, it was reasonable to ascribe a similar appearance in glaucoma to a similar cause. The sequence of colours in the glaucoma halo is the reverse of that seen around the moon due to particles of ice in the atmosphere. The glaucoma symptom was such as would be produced by the reflection of light from the surfaces of the rhombic prisms of acid sodic urates. Such an explanation would account for the influence of the well-recognised exciting causes of the symptom.

Glaucoma with Intra-Ocular Hæmorrhages.—Dr. Charles A. Oliver, of Philadelphia, reported the case of a patient suffering from grave nerve and cardiac disease, and affected with thrombosis or embolism in an eye that had been the subject of retinal hæmorrhage, and had shown signs of increased intra-ocular pressure. Repeated hæmorrhages with increased exacerbations of peri-orbital neuralgia took place. Iridectomy relieved the pressure and pain for two months, when an acute attack necessitated enucleation. Microscopic sections showed disintegration of tissue, especially at the posterior pole of the eye in the deeper layers of the retina, and in the uveal tract from the presence of disorganised blood and lymph.

A second case with a similar clinical history, but contrasted result, occurred in an apparently healthy middle-aged man. Comparatively painful blindness gradually developed in the left eye, with almost complete annihilation of vision on the more neuralgic side. Iridectomy was done upon a degenerate eye, but slightly vascular tissue. Several months' relief was followed by another attack, and by a similar uncomplicated operation the process was checked. A cataractous and swollen lens was then extracted, giving improved vision.

Dr. Oliver concluded that in some extremely rare cases of glaucoma, secondary to slight recurrent attacks of intra-ocular hæmorrhage, especially in subjects in whom the vascular system is not greatly involved, the eye may be kept in a condition of usefulness by appropriate hygiene and general therapeutic measures, and the performance of proper operative procedures whenever there is urgent necessity to relieve the increasing intra-ocular pressure.

Manifest Refractive Errors in Plastic Iritis.—Dr. Oliver, from an experimental and clinical study of the subject, concluded that the increased refraction frequently found was not due to forward displacement of the lens, or to an increased index of refraction of the aqueous by the inflammatory process. That it was due to spastic tonicity of the ciliary muscle, or congestion with rigidity of the ciliary body, he believed to be demonstrated by the effects of mydriatics and myotics, which would respectively diminish or increase the refractive error from 0·25 D. to 0·75 D., so long as the inflammatory process had not subsided.

Epithelioma simulating Meibomian Cyst.—Dr. G. E. de Schweinitz, of Philadelphia, demonstrated the microscopic specimens of a small tumour of the lid which had been removed from a man, aged 40, the clinical characteristics of which were exactly those of an ulcerated Meibomian cyst. The sections, however, showed the growth to be a glandular carcinoma. Similar instances had been recorded by Fuchs, Sourdille, and other authors.

Monocular Diplopia.—Dr. de Schweinitz described two cases of monocular diplopia. The first was a man, aged 47, who had sustained a severe injury of the head in a railroad accident, and presented the clinical symptoms of traumatic neurasthenia. The eyes, with the exception of the monocular diplopia, were normal. In the second case, this character of diplopia was found in a woman suffering from organic disease of the spinal cord, but who presented, also, numerous hysterical manifestations. Both eyes were highly astigmatic, and in each there were small patches of macular choroiditis.

Skin Grafting for Epithelioma.—Dr. de Schweinitz described and exhibited photographs of a case of epithelioma of the lower lid removed from a woman, aged 40, a portion of the gap after excision having been filled in with a piece of integument taken from the thigh, so cut as to include only the skin, and none of the subcutaneous fat. One year later this flap was firmly incorporated with the surrounding tissues, from which it was distinguishable by its slightly paler colour. It had shrunk to about one-third of its original size, but had accomplished the purpose for which it was inserted, as the lid was accurately in place, and there was no ectropion.

Panophthalmitis following Discission.—Dr. S. Theobald, of Baltimore, reported the case of a negro boy, probably the subject of inherited syphilis, in whom discission was performed for capsular opacity. Careful antiseptic precautions, including sterilisation of the instruments employed, were practised, yet the whole cornea sloughed, and the eye was practically destroyed within forty-eight hours after the discission (a smooth and satisfactory operation) was performed.

Absolute asepsis in eye operations, he thought, was not attainable; but, on the other hand, the conjunctival sac is not a favourable field for the development of pyogenic organisms, and, in consequence, suppuration rarely occurs, notwithstanding our imperfect antiseptic measures. The lessened resisting power of the cells and fluids of the body, due to the inherited syphilis, was thought to be a factor in this case.

Subnormal Accommodative Power.—Dr. Theobald reported cases of this condition in persons under the presbyopic age, to which he had called attention in a paper read before this Society in 1891. In eyes, in every respect normal, the vertical diplopia test should show orthophoria at twenty feet, but exophoria of from 3° to 5° at the reading distance, or, put in other words, the vertical diplopia test at thirteen inches should give, as compared with the test at twenty feet, a difference in favour of the external recti muscle of from 3° to 5°. When this is not the case, " subnormal accommodative power" (due to a weak ciliary muscle, or an inelastic, irresponsive lens) must be assumed to be present. This condition may exist apart from refraction or other muscular errors, or may be associated with them. Its existence in emmetropia calls for convex glasses for near vision only ; in hypermetropia for stronger glasses for near vision than would be prescribed simply for the correction of the hypermetropia, and in myopia for weaker concave glasses for near vision than would otherwise be indicated.

Failure of the Ophthalmoscope to reveal Latent Hyperopia.—Dr. Theobald reported a case illustrating this, although as a rule in expert hands, he thought all, or nearly all of the hyperopia could be detected by the ophthalmoscope without the employment of a mydriatic. The case was that of a lad, 9 years of age, with asthenopia and miliary choroido-retinitis. Only 1D. of hypermetropia was revealed by the ophthalmoscope in the right eye, and slightly more than this in the left eye, yet a mydriatic showed 4D. in the right eye, and five in the left, with slight additional astigmatism in each.

Muscular Asthenopia.—Dr. G. W. Hale, of Nashville, read a paper upon this subject, taking the ground that the condition was essentially a disturbance of innervation and a central disorder in most cases. This being the fact, the local treatment by the use of prisms is resorted to. Tenotomy or advancement of the recti muscles was for most cases illogical, and should not be done. Instead, he employed orthoptic exercise and general treatment.

Practical Value of the Ophthalmometer.—Dr. Edward Jackson, of Philadelphia, from a comparison of the measurements obtained with Javal's ophthalmometer with those obtained subsequently by other methods, under full paralysis of accommodation, concluded that in the usual run of cases of ametropia, the corneal and total astigmatism were identical in about 6 per cent. The amount of corneal and total astigmatism corresponded in 52 per cent., and the direction of the principal meridians in 44 per cent., and approximately in 89 per cent. Because of the lack of correspondence between the corneal and total astigmatism, the indications of the instrument cannot be regarded as accurately showing the amount of astigmatism to be corrected by lenses. Ophthalmometry must take its place among the approximate tests in the practical working out of ametropia. Among these, the definiteness of its indications, and the ease and rapidity with which they may be obtained, give it a high place. As an instrument of scientific precision for purposes of original investigation, and as a means of practically determining astigmatism in aphakic eyes, it has a more definite and positive value.

Practical Value of Low Grade Cylinders.—Dr. Joseph A. White, of Richmond, wished to protest against the statement that low grade cylinders had no practical value in asthenopia; and in support of his contention submitted a statistical table of one hundred cases of asthenopia caused by low astigmatism, which were much improved or cured by the use of cylinders; some temporarily and some permanently. The cases included eight in which the astigmatism was with the rule, axis 90°, with eyes differing in refraction; thirteen cases in which the axis in one eye was at 90°, and in the other at an inclination at from 15° to 40°; thirty-three cases in which the axis varied from 15° to 30° in the vertical in both of them, and twenty cases in which the astigmatism was against the rule, axis horizontally; eighteen cases in which it was from 15° to 30° from the horizontal, and eight cases of astigmatism with the rule in one eye, and against the rule in the other. The patients' ages varied from ten to over forty years. The cylinders prescribed were 0·25D. for both eyes in fifty-three cases; 0·25 for one eye and 0·50D. for the other in twenty-eight cases; 0·50 for both, or 0·50D. for one eye and 0·75D. for the other in nineteen cases.

Twenty-two patients complained of headache without tracing it directly to the eyes, and seventy-eight complained of difficulty of vision, eye-ache, &c. Six had blepharitis; three chronic conjunctivitis and four spasm of accommodation. No glass was prescribed unless it improved distant vision. In no case was 0·25D. or 0·50D. cylinder in both eyes prescribed; generally both were alike or the defect was "according to the rule." He believed this kind of astigmatism was strictly physiological. In his experience, such low grade cylinders proved of practical value. If the statements of patients as to relief in such cases were not accepted, what evidence could we have of the efficacy of any therapeutic measure.

Correction of Ametropia arresting the Progress of Myopia.—Dr. S. D. Risley, of Philadelphia, presented a statistical study of the results of the general correction of ametropia in asthenopic eyes in Philadelphia for the last twenty years. He had claimed as the result of his school statistics, published in 1881, that the faulty methods and environments of the schools were not solely responsible for the increasing percentage of myopia in the schools, but that the eyes which acquired this anomaly of refraction were recruited from those eyes which entered upon the educational process with congenital anomalies of refraction, particularly astigmatism. This view was based upon the fact that in his school examinations, not only did the emmetropic eyes or those most nearly approaching this ideal state of refraction, remain in nearly uniform percentage throughout all periods of school life, but that they enjoyed the highest acuity of vision and the greatest immunity from pain and disease, while on the other hand, in ametropia, especially in astigmatic eyes with hypermetropia, were found not only the asthenopic eyes, but the beginning of the pathological conditions which at a later stage in this history were everywhere recognised as characteristic of the myopic eye with increasing refraction. If this claim were true he reasoned that after twenty years, during which the existing defects of refraction had with great unanimity been corrected by glasses in all asthenopic eyes, by the ophthalmic surgeons of Philadelphia, the beneficial effect of such corrections should manifest itself in both a diminished percentage of myopic patients applying for relief, and in a lower grade of myopia than was found at the beginning of the period. An elaborate analysis of all the formulæ for correcting glasses ordered during the twenty years, was made from the record in his private case books and the prescription books of two large optical firms. Only the formulæ ordered for constant wear were included. The basis thus furnished included approximately 200,000 eyes. They were first grouped under successive periods of years, and second, according to the grade of myopia found for each period and the percentage calculated in each to all cases of ametropia, as shown by the glasses ordered.

During the first period, beginning with January, 1874, there was in the case books 28·43 per cent. of myopia, which steadily declined to 16·78 per cent. in the last period, ending with December, 1893. In the opticians' books there was 25 per cent. in the first, which sank to 15·2 per cent. in the last period. The lowering in the grade of myopia was equally significant, since in all the grades higher than 3D. there was a fall of nearly 50 per cent., while in the grades below 1D. there was a slight increase in percentage. This was accounted for by the fact that under treatment, and the careful correction of the ametropia, the increasing refraction had been arrested, and hence did not pass on to swell the percentage of the higher grades. Furthermore, that those asthenopic eyes which had applied for relief, before the increase of refraction had reached the stage of myopia, had been cured by their correcting glasses, and therefore did not develop myopia; hence the rapid and steady decline in the percentage of near sight.

OBSERVATIONS ON SOME PHASES OF OPACITY, AND ON LUXATION OF THE CRYSTALLINE LENS.[1]

By L. L. Thompson, M.D., Indianapolis, U.S.A.

As indicated in the title of this article, I shall present for your consideration some phases only of the opacities and displacements of the lens which have occurred in my practice during the last twenty-three years. There has been abundant opportunity for re-examination of cases, so as to enable me to verify conclusions. As the prognosis in any given case is of great interest to both patient and examiner, it shall be especially emphasised in the following lines.

Your attention is first invited to a segmental lenticular opacity which occurs downwards and inwards. In an article read ten years ago before the Ophthalmic Section of the American Medical Association at Cleveland, Ohio, I incidentally spoke of this peculiar opacity, but the Section did not publish its transactions of that year, and I have never published anywhere else what I then said. As several hundreds of similar cases have been added thereto since that date, I now feel far better prepared to speak on the points of interest connected with them than heretofore. In my first few cases it was supposed that the position of the opacities was a

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[1] Read at the Annual Meeting of the British Medical Association, held at Bristol, July, 1894.

Ophthal. Review, Vol. XIII., No. 156, Oct. 1894.

mere coincidence—that they were ordinary opacities which would slowly extend until they involved the whole lens tissue. But, as they were re-examined year after year, with no advancement of the cloudiness of the lens, and as fresh cases continued to multiply in my records, my patients were no longer informed that they had commencing cataracts, but sketches of the opacities were always placed amongst my notes for future reference.

These sketches have been made continuously from 1872 until the present time. It is but three months ago that one of my patients died whose eyes were examined in 1872, and many times subsequently, and yet during those twenty-two years not the slightest advancement of the opacity could be detected. The same can be said of all the other cases of this class which have been re-examined. The youngest person in whom this form of opacity appeared was 40, and the oldest 87 years. A large majority of them had the cloudiness when first seen, and it was usually in both eyes. A small number were examined before the slightest trace of it was visible. One of these is especially worthy of note. The patient had failing sight from acquired myopia, and floating bodies in the vitreous. She was examined very carefully under artificial mydriasis, especially for cataract (as she supposed that she had it), but not the least speck could be discovered in any part of the lens. She returned for re-examination in two years, when this downward and inward opacity in each lens was perfectly plainly to be seen. Many times have the opacities been re-examined since they first appeared, yet not one fraction of change has taken place.

The question naturally arises, why should a separation of the lens fibres occur so often and so suddenly in this part of each lens almost simultaneously? And why is it that the degenerative process is then and there arrested during the remainder of the patient's life? Occasionally the opacities are met with down and out, in addition to the position above described, but not oftener than about once in fifty. When they occur upwards also the prognosis is not nearly so favourable.

Another variety of opacity in which the prognosis is highly in the patient's favour, is the annular opacity of the lens, or the "arcus senilis lentis." Why it should be called "senilis" one cannot imagine, as I have seen it in one person but 23 years old, and and in many under 35, though never in children. It seems never to advance until the middle of life is reached, and even in old age does not go on to blindness; but instead it causes a peculiar speckled opacity of the anterior part of the lens, in addition to the narrow annular striation which occupied the extreme periphery years before.

Many of these cases have been under my notice for years, affording every opportunity of watching them through all their changes, and never yet has one of these annular opacities advanced far enough to require extraction. All of them occurred in women.

Before leaving this part of my subject, allow me to mention a case of complete opacity of the lens which disappeared spontaneously. The patient was 44 years old when he consulted me in 1876, with fully matured cortical cataract in his left eye, which he said "had been blind for a number of years." There was no trembling of the iris, and he did not know of ever having received any kind of injury. The right eye was normal in every way with V. = $\frac{20}{20}$. Eight years later he came again, with a commencing opacity of the right lens, and well marked iridodonesis of the left. The right went on to maturity, and the lens was extracted with iridectomy two years later. He did well for five days after the operation, when a hæmorrhage from the iris filled the anterior chamber, the pupil gradually closed, and, in spite of all our efforts to open it, he subsequently lost his eye. He became very anxious to have the left one operated on, but from my experience of the right, and the tremulous iris in the left, I feared to extract and made a preliminary iridectomy. In spite of every precaution a small quantity of very fluid vitreous followed the keratome; the iris was excised without further trouble, and we got a beautiful key-hole pupil. On the fourth day a hæmorrhage came on; iced compresses were used; the blood was absorbed in a few days, and a jet black pupil, about two millimetres in width, appeared, which extended from the edge of the lens to the corneo-sclerotic junction. Through this he could see to go about his premises, and in familiar streets of the city, but he could not see to read. He desired to see more, and urged an extraction, which I refused, owing to the fluid condition of the vitreous. For two years he occasionally called on me, and also consulted several other eye-specialists in neighbouring cities, who, like myself, determined to let well alone. On one occasion he called, complaining of much pain in the eye (which looked as usual), and he was given a weak solution of atropine. I saw nothing more of him for a few weeks, and then the lens was almost clear. One could still easily define its shape, but a fluid degeneration seemed to have taken place, leaving a few minute white specks upon the capsule. His vision $= \frac{20}{100}$ with + 11D. sph. He retained very good sight for several years, and could read and drive about the city alone; but finally he became blind from optic nerve atrophy, the lens remaining quite clear. He was a very hard and steady drinker for many years.

Luxations of the Lens.

Many of these appear in my records. Four cases of congenital ectopia lentis in both eyes occurred in one family and its immediate relatives. In all of these the lenses were displaced outward; they were all highly myopic, with decreased acuity of vision; they all had partial or complete iridodonesis. In one of these patients the lenses moved back and forth as on a hinge, and each lens was at one time dislocated into the anterior chamber, and had to be replaced by manipulation; but in one eye, this was not done until after it had started the glaucomatous process, and caused permanent dilatation of the pupil. The lenses ultimately settled down in the vitreous chamber, behind and below the pupil, and the eyes became as highly hyperopic as is usual after a cataract extraction, requiring + 10D. for distance and + 17D. for close work. This proved conclusively that the former myopia was entirely due to the mal-position of the lens.

I have met with several cases of luxation of cataractous lenses downwards in elderly persons. They were often overjoyed to find their sight restored, but in most of these cases their joy was sooner or later turned into grief, and their eyes were lost from irido-choroiditis, following prolonged or continuous pain. Others have called to learn the cause of their failing vision, which has been found due to congestion of the fundus, with floating particles in the vitreous humour, and hypermetropia. Positive lenses have been prescribed for distance, their reading glasses changed, and they went away satisfied for a time; but in one or more years they have returned, stating that their glasses no longer suited them; that they could see better without than with convex lenses. Their anterior chambers were found to be shallower, and their lenses closer to the cornea than when first examined; their hypermetropia had changed to myopia, or "second sight," a condition by no means desirable, as the factors which produce it often cause mal-nutrition of the lens and subsequent nuclear opacity.

Résumé.

First. Segmental opacities of the lower inner portions of the lens usually remain stationary for many years; rarely do they cause blindness.

Second. Annular opacity, or "Arcus senilis lentis," is often met with in persons under thirty years of age. Women seem to be more subject to it than men; it rarely passes beyond the periphery until after middle life, when it sometimes extends in the form of a minute speckled opacity of the whole anterior surface of the lens, again becomes stationary, and seldom causes blindness.

Third. Cataract is occasionally cured spontaneously by liquid degeneration within the capsule.

Fourth. Congenital ectopia lentis is by no means a harmless anomaly. Its subjects are usually highly myopic, and have greatly reduced acuity of vision. It may cause loss of vision by glaucoma, and ultimately destroy the sight by luxation of the lens downward, thereby starting inflammatory action.

Fifth. Spontaneous luxation downward of the cataractous lens of an elderly person often takes place. It gives temporary sight to the patient, but the end is usually suffering and loss of vision.

Sixth. "Second sight" is a danger signal. It is not always caused by increase in the conjugate axis of the lens incident to incipient cataract. It is frequently present long before the faintest sign or symptom of cataract. It is often brought on by long continued congestion of the fundus (as seen by numerous minute floating particles in the vitreous humour), by a relaxed suspensory ligament, and by luxation of the lens forward.

C. HESS (Prague). Investigation of the After-images which follow Brief Excitation of the Retina. *Pflueger's Archives für Physiol., xlix., p.* 190.

Although the phenomena which appear after a long exposure of the retina to light have been well studied, we hardly have any observations recorded of the manner in which the retina returns from the state of excitation into that of rest after a very short exposure.

Of the few previous investigators, Helmholtz comes to the conclusion that immediately after a short exposure to a lighted object, a positive after-image follows. He further says that in the parts of the retina exposed to the momentary appearance of a light object, the excitation continues after the light has been shut off, and further, that the susceptibility for fresh excitation is diminished for the time being.

Aubert, who experimented with objects lighted by the electric spark, comes to the same conclusion, viz., that the positive after-image forms an immediate continuation of the primary image formed on the retina, and that after-images, when produced by lighting with the electric spark, have only a positive phase.

Similar results were obtained by Fick, and described in the third volume of Hermann's "Handbook of Physiology." At the instigation of Hering, who had come to very different conclusions, Hess submitted the whole question to a careful investigation.

A small white disc was suspended in front of the open end of a wide tube lined with black velvet, and closed at the other end, thus forming a background as dark as it was possible to obtain. The white disc was lighted up by the electric spark; for the investigation of coloured objects, coloured glasses were placed between the spark and the disc. To facilitate the fixation of the disc in the absolutely dark chamber where these experiments were made, a small point was marked on the disc with luminous paint. Between every observation a pause was made of sufficient length to allow the eye to become rested. For a dark object on coloured ground, a white paper with a circular hole was placed in front of the velvet-lined tube, and lighted up by the electric spark and coloured glasses as before.

The examination of homogeneous light by means of the electric spark in the collimator slit of a spectral apparatus, led to difficulties, owing to the uneven lighting of the field. The spark does not always take the same path. It was found far more expeditious to use a Steinheil instantaneous photographic shutter with which the time of the lighting of the image could be regulated easily to between $\frac{1}{100}$ and $\frac{1}{200}$ of a second. Although the opening and closing of such a shutter is not absolutely instantaneous, the experiments gave the same result as with the electric spark. For some experiments the vision field was so arranged that one half of it could be lighted by a homogeneous colour, the other half—separated from it by a barely visible dark line—by another homogeneous colour, or by a colourless light of any desired intensity.

The production of a colourless light is not quite simple. The ordinary daylight is not colourless; that it appears so is due to the overwhelming amount of its white component, and further, to the adaptation of the eye for its coloured component. This is demonstrated by the colouring which the after-image shows. (In this way Hering has explained the coloured after-images observed and described so often after excitation of the retina by apparently colourless light.) By adding enough of the complementary colour to the daylight "white," the after-image produced becomes quite colourless, thereby indicating that the primary image was produced by a colourless light.

Experimenting with such colourless light and with exposures of $\frac{1}{100}$ of a second and less, during which the *white* disc appeared lighted, it was found that the sensation of light diminished very rapidly after the exposure ceased, occasionally to such a degree that it was replaced by a *dark* circular spot of blurred outline and surrounded by a somewhat lighter halo. After a further short interval it was almost suddenly replaced by a sharply defined light disc on a dark ground. This is the phase hitherto described as the "positive after-image." The brightness of this positive after-image decreases very much slower than that of the primary image after the exposure had ceased. After three to six seconds the positive after-image usually disappears completely. Often, however, a faint *second* negative after-image can be observed.

After exposure to a coloured disc on dark ground the eye perceives a dark after-image of complementary colour and of excessively short duration. This is followed by a positive light-image showing only very faintly the colours of the primary disc. After a sufficient adaptation for colourless light, by rest in the dark, the eye may perceive this "positive" after-image as quite colourless. The cause for this phenomenon must be looked for in the circumstance that in daytime ordinarily the eye is fatigued by and for white but not—or only little—for coloured light. After sufficient rest in the dark the excitability for white light is greatly increased, while it is hardly altered for coloured light. Hence the excitation acts more strongly through the white than through the coloured valencies. The brightness of the positive after-image was very different for the various colours—being brightest for yellowish-green, and green, and darkest for red. This is due to the fact that light transmitted through glasses of these various colours shows the greatest amount of white valency in the yellow and green, and the smallest in the red.

In reversing the conditions of the experiment by choosing as the lighted object a white ground with a central dark disc, the result was analogous; immediately after the primary excitation a whitish disc—not sharply defined—is seen on a dark ground. This phase, the first negative after-image, is to be explained by Hering's successive induction of light. It is most rapidly followed by the image of a dark disc, sharp in outline, on a light ground—the positive after-image.

Substituting a coloured ground in this experiment for the white one, the primary excitation is followed by the image of a light disc of the colour used for the experiment on a dark ground of the complementary colour; a negative image due to successive colour induction. The appearance of the positive after-image follows rapidly: a dark and nearly colourless disc on a light ground faintly showing the colour used for the experiment.

In these experiments the difference of brightness shown by the positive after-image of the different parts of the spectrum is remarkable. In this respect it was found that the brightness is mainly influenced by the amount of white valency of the colour used. It can be expressed by a curve with its highest point in the green corresponding to the part of the spectrum between the lines E and *b*.

The examination of the after-image of a briefly exposed complete spectrum is exceedingly difficult and can only be completed by a series of repeated single observations. The result is as follows:—The immediate—negative—after-image was composed of a distinctly bluish portion in the less refrangible part, and a yellowish portion at the other end, best seen when the green in the original spectrum had been covered by a narrow black band. At the red end of the spectrum a greenish after-image was noticed, and at the green part after removal of the black band a reddish tint could be distinguished in the negative after-image.

Very soon after this appears the positive image is almost totally colourless, the brightest part between the lines E and *b* darkening gradually towards both ends, but more so towards the less refrangible portion. If there is any colouring noticeable it disappears rapidly. This colourless positive after-image lasts between four and eight seconds before fading away. Sometimes it is followed by a second faint, dark (negative) after-image on a somewhat lighter ground.

It is thereby proved by these experiments and observations that after a very brief excitation of the retina by light the sensation of light ceases rapidly, and is followed by a negative after-image of equal evanescence, of less than one-third of a second duration, which is in its turn replaced by a positive after-image of a duration and brightness depending on the intensity of the primary excitation and the state of the retina at the time. Sometimes a faint second negative after-image follows and closes the series.

Owing to the shortness of the first negative after-image it has been hitherto overlooked. The explanations which have been given to account for the phenomena following a very short excitation of the retina have become valueless in so far as they consider the positive after-image as a *direct* continuation of the primary excitation. Hess's experiments most strongly support the assumption of the separate perception of white and of coloured valencies, and do not appear compatible with a theory which attributes the perception of white to the simultaneous perception of various colours. K. G.

M. SACHS (Prague). On the Influence of Coloured Light on the Size of the Pupil. *Pflueger's Arch. f. Physiol., lii., p.* 79.

The power of light to produce a reflex contraction of the iris is called by the author its motor valency, analogous to Hering's terms of optical valencies. If a certain light falling on the eye produces a certain size of the pupil, and is then replaced by another totally different light, the size of the pupil will either remain the same, or become smaller or larger, according as the amount of motor valency in the second light is the same or larger or smaller than in the first. If the pupil remains of the same size, then the two lights are equal in motor valency—" motor equivalent." It must be possible to find for any two colours their motor equivalent by increasing or reducing the intensity of the one or the other as the case may be. Considering that a light of primary red or primary green acts only by its white valency on the red-green blind zone of the retina, it was necessary to examine whether the motor valency of any given colour was due solely to its white valency. If such were the case, the nervous apparatus which regulates the reflex action of the pupil of a normal eye would react on coloured rays exactly like a totally colour-blind eye.

The method of examining the motor valency of two colours was based on observing entoptically the movements of the iris aperture. As pupillary reaction to light thrown into one eye affects both irides equally, one eye could be used for looking at the various colours, while the other could observe the pupillary reaction.

In a sort of solid spectacle frame mask two tubes were placed of different length, a long one for the eye which was to examine the colour, and a short one for the other eye. This short tube was closed by a disc movable to and from the eye, and perforated by two small pin-holes for the production on the retina of two entoptic dispersion circles varying in size with the variation of the pupil. By moving the perforated disc to and fro, a position could always be found where the two dispersion circles just touched each other. Contraction of the pupil caused them to shrink and to recede from each other, while enlargement of the pupil made them overlap.

The examination was principally carried out with coloured papers. Care was taken to eliminate such causes for iris movements as convergence and accommodation, and also to shield the eye from stray light. A coloured paper was placed on a table. Over the paper a black wool-paper was fixed with a circular hole cut in it, thus showing the coloured paper on a black ground. A sort of cross wire in the hole facilitated fixation of the eye. After looking at the coloured paper a grey paper was then placed suddenly behind the hole in the black paper, thus replacing the coloured disc. An alteration in the size of the pupil indicated then in which direction the difference between the motor valency of the coloured and of the grey paper lay.

When a paper as nearly as possible of the colour of spectral red was compared in full daylight with a grey paper of equal white valency, the grey invariably produced an enlargement of the pupil, thus showing a smaller motor valency. The comparison of a green paper with a grey one of equal white valency gave the very opposite result, the grey having therefore the greater motor valency.

Similarly, blue and yellow showed an analogous difference; the blue showed a smaller, the yellow a greater, motor valency than their corresponding grey tint of equal white valency. The motor valency was thus shown to depend, not only on the white but also on the colour valencies.

It had then to be inquired in what relation the brightness of a colour (the apparent luminosity) stood to its motor valency.

Hering and Hillebrand had shown that the luminosity of a colour depends not only on its white, but also on its colour valencies, and in such a manner that red and yellow increase it, while blue and green diminish it.

In order to ascertain the luminosity of any given colour in a given light this colour was compared with a series of graduated greys. It is very easy by running a small bit of any coloured paper along such a graduated scale of greys to find the one grey shade which appears to be of the same luminosity. It was found that pigment colours of equal luminosity were of equal motor valency. Further: under different conditions of lighting, the luminosity and the motor valency changed in the same sense, *e.g.*, a certain yellow and a certain blue appeared to an eye adapted for darkness to be of the same luminosity, and showed the same motor valency. Increase of lighting made the yellow appear more and more bright than the blue, and in like manner the reaction of the pupil showed an increased motor valency for the yellow under these conditions.

Finally, inquiry was made as to how far the colour-blind periphery of the retina reacts on colours that have motor equivalency for the centre of the retina. Owing to the possibility of absorption by the pigment of the yellow spot, these experiments were carried out with *red* only, and it was found that of a red and of a grey of equal motor valency for the yellow spot, the periphery showed a much greater motor valency for the grey than for the red. It is therefore probable that for the red-green blind, or for the totally colour-blind eye, certain coloured lights have not the same motor valency as they have for the normal eye, in which case a method for the *objective* recognition of partial or total colour-blindness could be constructed.

K. G.

I. DOGIEL (Kasan). On the Influence of the Nerves on the Variations in the Size of the Pupil.

Pflueger's Archives f. Physiology, lvi., p. 500.

In this paper the author gives first a short account of the results obtained by previous workers from experiments on the influence of certain nerves on the pupil.

Claude Bernard showed first that the nerve fibres in the sympathetic which dilate the pupil are distinct from the vasomotor fibres. He further demonstrated that a reflex dilatation of the pupil could be obtained from all sensory nerves—from the sciatic to the fifth nerve. The search for the central seat of this mechanism led Knoll in 1869 to localise it in the anterior corpora quadrigemina. Since then a great many experimental investigations have been made by Schiff and Pio-Foa, Ferrier, Hensen and Voelkers, Jegorow, &c. In 1893 Braunstein published in Russian his investigations, and arrived at the following results:—

(1) The nerves which dilate the pupil in mammals leave the cord in the anterior roots, the seventh and eighth cervical, and first and second dorsal (thoracic) nerves, and go to the first thoracic ganglion through the rami communicantes, thence through the anterior branch of the annulus of Vieussens to the inferior cervical ganglion, and thence through the cervical sympathetic to the superior cervical ganglion. Emerging from this by the carotid branch they join the first part of the trigeminal at the

Gasserian ganglion, and passing by, but without joining, the ciliary ganglion, reach the eye through the long ciliary nerves.

(2) The reflex dilatation of the pupil after sensory stimulation is not brought about through the sympathetic, but by the depression of the tone of the nucleus of the third nerve.

(3) Reflex dilatation of the pupil can be obtained from the sympathetic system by stimulating the sensory fibres contained therein.

(4) The anterior and posterior central and anterior supra-sylvian gyri are the parts of the cortex which cause dilatation of the pupil on electric stimulation.

(5) The cortex has an inhibitory influence on the nucleus of the third nerve, and also on the centres which transfer the reflexes from the sensory nerves.

(6) Electric stimulation of the corpus striatum, corpora quadrigemina and inner surface of the thalamus causes a dilatation of the pupil, which is not affected by dividing the sympathetic or the cord, or by the previous excision of the upper cervical ganglion.

(7) In the frog the dilating nerves emerge from the cord in the anterior roots of the first six dorsal nerves, the third containing the greatest number, the first and second less, and the others fewer still.

From these conclusions it is shown that the majority of investigators assume the existence in the brain of centres for the dilatation and for the contraction of the pupil. It is, however, possible to demonstrate that the stimulation of one and the same *nerve* produces first dilatation of the one, and simultaneous contraction of the other pupil, followed by the reverse in both eyes, or by contraction or dilatation in both eyes.

Experiments in this direction were made by Dogiel on rabbits, cats, dogs, and various birds, mostly after curarisation, artificial respiration being maintained. Either on one or on both sides the sympathetic or the vagus was divided, and the head end (Kopfstumpf) of one or both nerves stimulated by a Dubois Reymond induction coil of known strength. The changes in the pupil were noted either by two observers or by photography, as is well illustrated by the plate which accompanies the paper. The most suitable animals for these experiments are rabbits (where sympathetic, depressor and vagus have an independent course), and, better still, cats, owing to the sensitiveness of their pupil and to the circumstance that both eyes can be photographed on the same plate. It was thus found that stimulation of the distal end (Kopfstumpf) of the sympathetic produces dilatation of the pupil of that side and contraction of the other pupil. Stimulation of the proximal end (Kopfstumpf) of the vagus is followed by contraction of the pupil of that side and dilatation of the other pupil. The amount of dilatation or contraction depends on the strength of the stimulating current. Simultaneous stimulation of the "head stumps" of both sympathetic and vagus, *i.e.*, of the distal end of the sympathetic and the proximal end of the vagus of one side produces oscillations of the pupil, with a prevailing tendency to dilatation of that side and to contraction of the other pupil. Stimulation of the proximal end of the laryngeal, depressor or sciatic nerve had the same effect as that of the vagus. It was further found that these variations of the pupils are modified by chloroform narcosis, during a certain stage of which stimulation of the proximal end of the vagus in the neck produces contraction of both pupils, whether one or both vagi are stimulated.

And not only can variations in the size of the pupil be produced by stimulation of afferent fibres, such as those of the vagus, laryngeal and sciatic nerve, but also of the optic (as is well known) and of the auditory. Strong acoustic impressions produce protrusion of the eyes and dilatation of the pupils. Dogiel concludes from these experiments that a physiological connection exists between the sympathetic and the dilating centre for the pupil of the same side and the contracting centre of the other side, and similarly between the vagus (sciatic, auditory, &c.) and the contracting centre of the same, and the dilating centre of the other side.

The difficult task remains to trace the anatomical path of these connections. An attempt has been made in this direction by Schutz, who tried in cases of progressive general paralysis of the insane with immobility of the pupil, to trace out the track from the retina and the optic nerve through the brain to the third nerve and the iris, but so far his anatomical investigations have not led to any definite results. K. G.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

D. Argyll Robertson, M.D., F.R.S.E., President in the Chair.

Thursday, October 18, 1894.

Case of Filaria Loa in which the Parasite was removed from under the Conjunctiva.—The President read notes of this case. The patient, who was a woman, aged 32, came to him in September, complaining of the presence of a worm in her eye. She had resided in Old Calabar, on the West Coast of Africa, for some years, but had been obliged to return home on account of intermittent fever and dysentery. She had first felt the worm in her eye last February. It gave her a sensation of pricking or quivering, and she was quite conscious of its movements. It wandered over the eye beneath the conjunctiva, and raised the conjunctiva into a small ridge as it moved; it sometimes left one eye, and could be felt travelling beneath the skin over the bridge of the nose, and reappeared in the other eye; lately it had kept to the left eye. Sometimes the eye was tender and a little bloodshot after the appearance of the worm. The influence of cold on the behaviour of the worm was very curious. In the warm climate of Africa it appeared frequently, and, as after her return to England the patient was confined to the house and to bed, the worm frequently appeared beneath the conjunctiva; warm rooms increased its activity. As she began to leave her room and went out, the worm disappeared into the deeper parts, and was seen only rarely. During the summer its visits were very few, but in September, as soon as the house was warmed, the worm reappeared. When seen the eye appeared normal, except for a small vesicle at the outer part of the conjunctival *cul-de-sac*. The patient was instructed to come again when the worm was active. On September 12 the worm was felt moving again; she applied hot cloths to the eye and immediately went to the hospital, where she was seen by Dr. Argyll Robertson. The worm could then be seen moving tortuously beneath the conjunctiva; the finger was applied to it and the worm kept in position while the eye was cocainised. The conjunctiva was grasped, an incision was made, and the worm withdrawn. The worm looked much like a piece of fishing gut; it wriggled at first, but when placed in a weak solution of boracic acid it died at once. It was 25 mm. long, and 0.5 mm. wide; its head tapered slightly but its tail tapered very much. There was a fine filament wound round the worm which appeared to be its alimentary canal, forcibly squeezed out by the grasp of the forceps. From its size it was probably the male animal. It was difficult to determine how the parasite had gained entrance to the body; the drinking water had always been boiled, and in washing her face she was always careful to use the boiled water. She had not eaten uncooked vegetables; mosquitoes abounded. No filaria were found in the patient's blood, but the worm was probably a male one. Several other cases were mentioned of this filaria being present beneath the conjunctiva; the patients were all members of the Old Calabar Mission; it was a very common occurrence among the negroes. It was probable that the parasite gained admission to the body through the water in some way; the embryos were sucked up in the blood by mosquitoes, who played the part of intermediate hosts;

hence they found their way to water again. They were limited strictly to this small part of Africa.

Dr. Patrick Manson said he had paid great attention to the parasites of Africa, and especially of Old Calabar. The blood of 50 per cent. of the negroes contained embryos of filaria. The filaria diurna was a form which appeared in the blood during the day and disappeared during the night; in his opinion it was identical with filaria loa; it could not be distinguished microscopically. He thought it very improbable that this filaria was the only one in the body in this case; the embryos existing in the body pass out probably by means of mosquitoes. The duration of life of a filaria was ten years or more. They varied in length from 17 to 70 mm.; the smaller ones were the males. He agreed with the President that the size of the one he had shown indicated that it was probably a male.

Filaria Oculi Humani.—Dr. Drake-Brockman read notes of a case of filaria oculi humani. The patient was a young Madras woman. When first seen there was a patch of redness at the edge of the cornea; soon the whole eye became red, but there was no pain. The cornea was dull, the aqueous muddy, the pupil had been dilated by atropine, the tension was + 1. A small worm could be seen in the anterior chamber, twisting about. The eye was cocainised, an incision made with a keratome; the aqueous flowed away, but the worm could not be found. There was some reaction after, but the eye eventually quieted down.

Card Specimens.—The following were the card specimens: Messrs. Hartridge and Griffith: Microscopic Sections of Tuberculous Keratitis.—Mr. Kenneth Campbell: Equatorial Rupture of the Choroid.—Mr. Marcus Gunn: Case of Lamellar Cataract of Unusual Form.—Dr. R. McIntosh: A Case of Lenticonus Posterior; and a Case of Associated Movements of the Left Levator Palpebræ and Internal Pterygoid Muscles.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

THIRTIETH ANNUAL MEETING, HELD AT WASHINGTON, 1894.

Dr. GEORGE C. HARLAN, President, in the Chair.

(*Continued from page* 312.)

Hyperopia and Squint.—Dr. H. F. Hansell, of Philadelphia, stated that in monocular squint, due to hyperopia, the deviating eye is invariably turned upward as well as inward. In alternating squint from hyperopia, the squinting eye is also invariably turned upward. A functional hyperopic esotropia or purely lateral deviation of the visual axes, is never found, but esotropia is associated with hypermetropia. The innervation of the elevators, he thought, accounted for this ; the superior rectus and inferior oblique are both supplied by the oculo-motor nerve, while of the depressors of the cornea, the inferior rectus and superior oblique, only the former receives its impulse from that nerve. Over-stimulation of the third nerve in hyperopia then causes over-action of all the muscles supplied by that nerve, and, as the external rectus cannot maintain lateral equilibrium, the elevators of the cornea are only in part antagonised by the depressors and an upward deviation results. The same explanation holds for esotropia-hyperphoria, found with hyperopia and hyperopic astigmatism.

In these conditions, the treatment indicated is for monocular squint, tenotomy of both interni and tenotomy of the superior rectus of the squinting eye, and possibly of the inferior rectus of the fixing eye. The endeavour to correct by operation on the squinting eye alone is greatly to be deplored. In alternating squint only the lateral muscles should be operated upon. It was also pointed out that for hyperphoria operation was only to be resorted to when correction of hyperopia had failed to give relief. The possibility of the transference of the tendency upward with alternation of fixation must also be borne in mind.

Strabismus with Duplicate Fixation.—Dr. C. H. Thomas, of Philadelphia, read a paper upon this subject. See OPHTHALMIC REVIEW, September, 1894, p. 281.

Modification of the Ophthalmometer.—Dr. W. S. Dennett, of New York, exhibited a hood containing two electric lamps to be slipped on the barrel of the ophthalmometer and revolved with it, which he had found to give a much better illumination of the wires than was obtained even by the arrangement of four fixed lamps near the patient's face. He also showed wires graduated on the principle of the vernier, enabling the observer to measure the corneal astigmatism with accuracy to one-tenth of 1 D.

Disc for Skiascopy.—Dr. W. E. Lambert, of New York, exhibited a complete and elaborate arrangement of lenses, spherical and cylindrical, in two discs for use in the shadow test. The discs were rotated by the observer by means of two rods, one revolving within the other, and gave a complete lens series.

Examination of the Eyes of Schoolboys.—Dr. B. A. Randall, of Philadelphia, reported on the results of repeated examinations of the eyes of pupils in the Penn Charter School. The examination included tests of visual acuteness and colour perception, ophthalmoscopy, and the measurement of refraction by the shadow test. With proper arrangements and assistance, such an examination was made in from three to five minutes for each case.

Coloboma of the Lens.—Dr. C. F. Clark, of Columbus, reported a case in which this anomaly was present in both eyes without any coloboma of the iris or choroid. The patient possessed a good power of accommodation.

Rupture of the Lymph Sheath of a Retinal Vein.—Dr. Albert G. Heyl, of Philadelphia, reported a case in which this had occurred, allowing the vein to bulge out in the vitreous in the form of a loop. The remains of the sheath left behind in the original track of the vessel appeared as a white point slightly broader than the calibre of the vein. Three separate ruptures existed in the same vessel. From two the loops stood out in the vitreous, in the third the vessel lay curled on the retina but outside of its sheath.

Associated with this lesion was a long connective tissue growth extending from the optic disc into the vitreous, which he ascribed to the escape of lymph corpuscles into the vitreous as the result of the rupture and their development into connective tissue fibres.

Colloid Disease of the Macula.—Dr. G. E. de Schweinitz, of Philadelphia, described two cases of macular disease presenting symmetrical appearances analogous to the so-called drusen in the nerve head, which were illustrated by water colours. The lesions were variously shaped, chiefly roundish bodies, resembling small masses of boiled sago or tapioca, of a yellowish white or reddish yellow tint. These bodies were so related one to the other that they presented somewhat the mulberry appearance of the so-called hyaline or colloid outgrowths in the optic papilla, although the bluish gray tint of the latter lesion was not present in this macular deposit.

Dr. de Schweinitz compared these appearances to the varicosities of the choroid described by de Wecker and Masselon, the central guttate choroiditis figured by Tay, and some of the types of degeneration of the macula which have been recorded by Nagel under the name of hyaline growths, and crystalline deposits on the inner surface of the choroid. Both of the patients were young women under thirty years of age, and the macular disease produced no disturbance of vision. One of the patients was healthy, with the exception of atonic amenorrhœa ; the other was the subject of chronic Bright's disease. Dr. de Schweinitz reiterated his belief that the colloid excrescences of the lamina vitrea and the so-called " drusen " in the nerve-head were not identical lesions.

Optic Atrophy.—Dr. Charles W. Kollock, of Charleston, reported the case of a young woman, who, five years before, had fallen on her head from a tricycle. Though apparently uninjured, vision failed rapidly, and she became almost blind ; both pupils were partially dilated, sluggish in reaction, the media clear, both discs greyish-white, vessels somewhat contracted, fields fairly good. Right eye, light perception; and left, vision $\frac{4}{200}$. Potassium iodide was given in increasing doses until one hundred grains three times a day were taken. Soon the pupils began to react better and became smaller, vision improved to $\frac{15}{200}$ in the left eye, and was later $\frac{15}{100}$. There was no history of syphilis, and it scarcely seemed probable that there was any fracture of the base of the skull by the fall. Strychnia, though tried, had failed to do good.

Ectropion Uveæ.—Dr. Lucien Howe, of Buffalo, reported three cases of this condition, in which the corrugated mass was distinctly pedunculated. He had observed the condition in connection with myopia, and thought the relation between them was more than a simple coincidence.

Squinting from Cerebral Traumatism.—Dr. Kollock reported the case of a woman aged 30, who two years before fell, and struck the head, causing prolonged unconsciousness, slight hæmorrhage from the right ear, and persistent diplopia, the left eye being turned up; and in addition to the vertical separation, being slightly crossed. The patient was able to secure single vision by holding the head down, but this caused great pain in the back of the neck. The superior rectus of the left eye was divided and also the inferior rectus of the right, but some diplopia continued at certain times.

Congenital Entropion.—Dr. J. A. Lippincott, of Pittsburg, reported a case in an infant aged 6 weeks. Both corneæ were extensively ulcerated, the corneal affection having within a few days made rapid progress. Canthoplasty was performed on both sides. Four weeks later the corneæ were practically clear, and the position, appearance and action of the lids normal.

Loss of Vitreous in Cataract Extraction.—Dr. Lippincott reported a case in which this had been excessive, but followed by recovery. The patient, aged 31, had lost the left eye by injury. On making a corneal incision in the right, the vitreous began to ooze out—almost imperceptibly at first, because the fluid was so watery. The eyeball gradually collapsed, deep wrinkles showing themselves in the sclera. After the removal of the lens, which was accomplished by means of a spoon, leaving a tough capsule behind, the globe did not look any larger than the end of an average sized finger. The case seemed hopeless, but the eye filled up, and in four weeks fingers could be counted. The patient had several attacks of iritis, as a result of which the iris became adherent to the capsule. Four months after the operation vision corrected was $\frac{15}{100}$, and improving steadily.

Exhibition of Instruments and Card Specimens.—Dr. F. M. Wilson, of Bridgeport, Conn., exhibited a pocket perimeter, and Dr. J. A. Andrews, of New York, a compact steriliser. Dr. Oliver presented a model eye for practice with the ophthalmoscope in studying refraction, and also showed a sketch of a typical case of embolism of the central artery of the retina.

Luxation of Lens, Secondary Glaucoma.—Dr. Clark reported a case in which spontaneous luxation of the lens had occurred in both eyes and terminated in glaucoma, with pupils movable and not widely dilated.

AMERICAN MEDICAL ASSOCIATION—SECTION OF OPHTHALMOLOGY.

Forty-Fifth Annual Meeting, held at San Francisco, June, 1894.

Albert R. Baker, M.D., Chairman.

Chairman's Address.—In opening the meeting, Dr. Baker called attention to methods of facilitating and advancing the work of the Section, and spoke of the need for a better training of all medical practitioners in the elements of ophthalmology.

Oculo-motor Physiology.—Dr. F. B. Eaton, of Portland, Oregon, called attention to certain oculo-motor phenomena and discussed their significance, as bearing upon some recent theories of asthenopia. The laws governing physiological processes constitute the foundation of our knowledge of pathological conditions. Insufficiencies of the oblique muscles called cyclophoria have recently been announced as a frequent cause of asthenopia. The test relied upon to reveal it was the use of the Maddox prism before one eye while viewing with both eyes a line held parallel to the base of the prism. Under this test, when the middle line, as seen by the free eye, was found inclined to the upper and lower lines seen through the prism, "cyclophoria" was said to be present.

Years ago it was demonstrated by Le Conte and others that in fixation with convergence of the visual axes to the ordinary working distance, an outward rotation of the upper end of the vertical meridian of the cornea occurred. This could be verified by taking a black thread with a knot in the middle, sticking it on a plate of glass and holding it before the eyes with the thread vertical, and the visual axes converging to the knot, and gradually approaching it to the eyes. At a distance of four to six inches, the appearance presented is that of two threads crossing each other at the knot. This rotation usually disappears when the eyes are directed downward at an angle of about 45°, and is increased by directing them upward. In some cases it is not present, and in others the rotation is in the opposite direction. Common experience shows that such a rotation does not interfere with binocular vision.

In regard to the alleged distortion of retinal images by astigmatism with oblique meridians, and the supposed lack of correspondence between the retinal images of the two eyes of this kind, and its correction by a symmetrical action of the oblique muscles, Dr. Eaton pointed out that the distortion must be quite insignificant, since the distortion produced by even a strong cylinder rapidly diminishes when this is approximated to the eye; and further that no rotation of the globe about the visual axis could help matters, because while lines running in one direction were made to correspond, others running at right angles thereto would be removed so much farther from correspondence.

He pointed out that no complete correspondence of the images on the two retinæ was necessary, since binocular vision depended on the fusion of slightly different images, and that non-coincident images lying outside the point of fixation are habitually neglected; inaccurate retinal images being translated into accurate mental impressions.

He, therefore, concludes that the phenomena included under cyclophoria are strictly physiological.

Discussing the theory of abnormal innervations as the cause of heterophoria and its curability by ocular gymnastics of a certain kind, namely, the weighting of convergence by adduction prisms at the near point, and carrying fixation gradually to a distance, and the contention that doubling the adduction at 20 feet had nothing to do with muscular strength and tendon insertions, he said this was not in accord with physiological facts.

Under the laws of nutrition, vigorous contraction of a muscle increases its strength, so that the same original amount of force may liberate more energy. The device of weighting convergence at the near point and then carrying fixation to a distance is of value in first developing the positive portion of the patient's relative convergence. But the same thing may be done with a rotary prism, and fixation at 20 feet. When the average adduction at 20 feet has been acquired, the method becomes one of ordinary ocular gymnastics. By it, the innervation power is not increased so much as made available, and this may be very speedily accomplished. The increase of actual muscular power is more slowly developed.

Experience teaches that even after correction of all refractive errors and careful attention to the general health and peripheral reflexes, anomalies of balance of the eye muscles may demand complete tenotomy.

Objective Tests of Ametropia.—A committee composed of Drs. Edward Jackson, S. M. Burnett, H. V. Würdemann and J. H. Thompson, reported upon this subject. After discussing the relative advantages of subjective and objective examination, they conclude thus: Ophthalmoscopy is capable in many cases of accuracy to within 0·50D. for H. or M. or 0·75D. for astigmatism, yet cases occur often to the best observers where the error will be much greater. Ophthalmometry, more appropriately named keratometry, is accurate in that it measures to within 0·25D., but it measures only corneal astigmatism, which, in the majority of cases, does not accurately correspond with the total astigmatism of the eye. Skiascopy is on the whole the most accurate and reliable objective method for estimating ametropia. With it an accuracy of one-eighth of a dioptre is obtainable with many eyes, and it indicates the refraction of the visual zone as distinct from that of other portions of the pupil. They think that the accurate determination of ametropia is best accomplished by the use of all these methods in each case, and commonly in the following order; the ophthalmoscopic examination, measurement of the cornea with the ophthalmometer, and skiascopy, to be followed by the subjective determination.

Retinoscopy as a Crucial Test.—Dr. B. A. Randall, of Philadelphia, in a paper read by the Secretary, called attention to the value of this as the final test in the correction of errors of refraction. He resorted to it after some idea of the ametropia present had been obtained, and again when lenses had been selected by the subjective test, the combination was submitted to the shadow test for confirmation or correction. Employing the plane mirror at a greater distance than was often mentioned, he found no need to make any allowance for distance, and was able to detect and demonstrate to others the change in the movement of light and shadow in the pupil by an alteration of the ametropia present to the extent of one-tenth of a dioptre.

Study of the Visual Zone by Skiascopy.—Dr. Edward Jackson, of Philadelphia, called attention to the fact that only a portion of the light that reached the retina was focussed; that in the dilated pupil often a large part of the area admitted light that was diffused upon the retina and only from a small portion was the light accurately focussed. This small part being alone concerned in accurate vision was called the *visual zone*. The existence of an extra-visual zone was the great obstacle to accuracy in estimating ametropia with the ophthalmoscope, and only by skiascopy, to which it was also an obstacle, could it be carefully studied and overcome.

To make such a study was the highest use of the shadow test, but in making it the method must be specially adapted to the purpose. The source of light must be small, must be accurately placed at the distance for which the eye is focussed, and the study must be made from a point near enough the pupil to allow the observer to discriminate between the different kinds of movement that may be presented in different parts of the pupil at the same time.

Simple Cataract Extraction.—Dr. A. H. Voorhees, of San Francisco, exhibited patients. He used the upward and downward section of the cornea indifferently and made no iridectomy. For irrigation of the anterior chamber he employed a form of large pipette with a glass bulb and a large rubber bulb to furnish pressure.

Value of Weak Lenses.—Dr. H. M. Starkey, of Chicago, had been led by recent discussions of the subject to ascertain the usual practice with reference to the use of cylinders of less than 0·50D. or sphericals of less than 0·75D. Of one hundred American ophthalmologists addressed with reference to the subject, seventy-five had responded. Of these sixty-six prescribed such lenses, four did it but seldom, three used the sphericals but not the cylinders, and two employed neither; one of these having discontinued the prescription of such lenses because he was convinced they were useless. The indications found for their use by those employing them were persistent asthenopia or reflex symptoms which disappear when the lenses are adjusted and remain absent while they are worn, but in many cases when the glasses were omitted the symptoms returned. He appended the reports of fifty cases drawn from the practice of forty different ophthalmic surgeons.

Asthenopia.—Dr. C. M. Hobby, of Iowa City, in a paper read by the Secretary, said that asthenopia is to vision what dyspepsia is to digestion—a group of symptoms differing somewhat according to the pathological views of the physician in charge. It is too often unrecognised that the refractive error is one factor and behind it exists a predisposing systemic condition. Some patients present simply the effects of over work. It would be of advantage to restrict the term asthenopia to the effects of prolonged work on eyes burdened by undue muscular labour of vision. No special form of refractive error predominates, and as patients suffer with the same errors as are possessed by those who do not suffer, the asthenopia seems to indicate inadaptability of the individual to environment. It is the individual not the eyes that are asthenopic. In some cases it is an effect of unaccustomed labour, or lack of time for adaptation to some form of eye work, or the work is taken up too late in life or continued undue lengths of time. It may also be due to ill-health, or to the irregular use of the eyes springing from lack of attention to work. He thought it time to call a halt on the indiscriminate optical treatment of asthenopia.

Cyclophoria.—Dr. Geo. H. Price, of Nashville, read a paper on the detection and treatment of cyclophoria, or insufficiency of the oblique muscles. Such a tendency of the eye to rotate on its antero-posterior diameter, he claimed might depend upon oblique astigmatism or faulty attachment of the oblique muscles. It is to be detected by viewing through a Maddox double prism, a line parallel to the base of the prisms, held in the middle line at the ordinary working distance; or by Maddox rods before both eyes, and a double prism before one of them and a light at twenty feet. With cyclophoria present, the middle line is seen by the patient not to be parallel, but oblique. The treatment advised was that suggested by Dr. Savage—the use of cylinders placed obliquely before the two eyes so as to produce the rotation of a line looked at; this rotation being varied by turning the cylinders so as to give rhythmic exercise to the oblique muscles. The symptoms complained of may disappear before the cyclophoria.

School Children's Eyes. — Dr. W. F. Southard, of San Francisco, made a plea for the examination of every child's eyes when beginning to attend school. School statistics show an enormous decrease in the number of children in attendance from the ages of 10 to 17; and while this is partly due to other causes, he is convinced, from questioning teachers and from contact with the children, that it was partly due to eye defects. Myopia has been carefully studied with reference to school life; but in reality hyperopia and astigmatism produce more serious disability. He urged the adoption of a law compelling a rigid examination of the eyes of every child beginning school work, by requiring on admission to the public schools a certificate as to the condition of the eyes and their fitness for such work, just as certificates of vaccination are now required.

Sub-conjunctival Injections in the Treatment of Eye Disease.— Dr. Wm. E. Briggs, of Sacramento, had, from watching the work of Darier and Abadie, become convinced that good results were obtained by this method in a certain class of cases. He had used it principally for those of septic or syphilitic origin. In such cases the patient should have the benefit of it. He believed it would establish a permanent place among therapeutic methods.

Scissors for Optico-Ciliary Neurotomy.—Dr. Briggs exhibited a form of double scissors modified by an attachment of double hooks, to hold securely and remove the excised portions of the nerve. He believed that this operation was valuable in young children where it was desirable to retain even a shrunken eye-ball where the diseased eye would look better than an artificial eye, or when the patient refused enucleation.

Treatment of Purulent Ophthalmia. — Dr. C. Scott, of Cleveland, detailed a plan, which for him had robbed the disease of its terrors, effecting a cure in a week or ten days instead of four or five weeks. It included the use of the following solution:—

Hydrastia sulphate	gr. v.
Acid. boric	gr. v.
Sod. biborate	gr. v.
Tinct. opii deod.	ʒss.
Aq. destillat.	℥j.

The eye was to be cleansed every fifteen or twenty minutes, cold applied by ice compresses when required, and the above solution to be injected into the upper and lower conjunctival sacs four to six times a day. The injection was made by means of a medicine dropper with a nozzle, long, smooth, and strong enough to be easily introduced beneath the upper lid without breaking. Once a day a one per cent. solution of silver nitrate was applied to the inner surface of the lids, but he wished to protest against the use of strong solutions of this substance.

Conservative Treatment of Wounds of the Eyeball.—Dr. L. H. Taylor, of Wilkesbarre, said: When confronted with an eye injury the question at once arises, "To what extent shall we interfere, and how far can the recuperative powers of nature be trusted to bring about a good result?"

Some text books teach excision of the iris at once if prolapsed, and if the wound be a penetrating one in or near the ciliary body to enucleate the ball in order to prevent sympathetic ophthalmia in the other eye. But the writer had seen many cases in which the iris was involved and let alone with as good results, or better, than in similar cases where an effort was made to remove the adherent portion. Unless seen early after the accident he does not attempt an iridectomy, and if early it is usually not necessary, for the iris can then be gently replaced with a spatula and the eye recover its normal appearance. Cases illustrating this were cited.

In a case of a wound in which cornea, iris, lens and sclera were involved, two months after the injury the ophthalmometer showed 12D. of astigmatism, and with —7D. cyl. ax. 30° + 5D. cyl. ax. 135° (not at right angles), the vision was $\frac{20}{40}$.

Another case was interesting from the nature of the wound and the subsequent restoration of the eye to almost normal vision. A young man was struck by a piece of glass above the eye, and inspection showed a ragged wound of the right upper eyelid three-quarters of an inch from its palpebral margin extending entirely through the lid and into the globe, through conjunctiva and sclera and into the vitreous, making a wound of the sclera half an inch to right and left and the same distance antero-posteriorly with exposure of vitreous. The wound was carefully explored for a foreign body, and then closed with silk sutures through the conjunctiva and dressed antiseptically. Subsequent progress was very gratifying, and two years later, with a correcting glass of $+ {\cdot}25 \frown + 2{\cdot}25$ cyl. ax. 75°, vision in the injured eye was $\frac{20}{30}$, the patient reading some letters of $\frac{20}{20}$. The case illustrated the wonderful recuperative power of the eye, and the value of conservatism in an eye which theoretically ought to have been enucleated. In wounds through the limbus his experience led him to conclude that a large number of these cases will do as well or better if the iris be replaced as if an attempt be made to remove it.

Eyes of School Children.—Dr. K. Pischl, of San Francisco, presented statistics as to the relative frequency of ametropia, hyperopia and myopia in the eyes of nineteen hundred children examined in the public schools of San Francisco.

Eye Symptoms in Locomotor Ataxy.—Dr. H. I. Jones, of San Francisco, reported and presented a case showing optic atrophy, in which there had been some improvement under treatment by counter irritants, strychnia and potassium iodide.

Dr. Edward Jackson was chosen chairman, and Dr. H. V. Würdemann secretary for the next meeting, to be held in Baltimore, beginning May 7, 1895.

THE ASSOCIATION OF BLEPHARITIS AND AMETROPIA WITH ANALYSIS OF ONE HUNDRED CASES.[1]

By Ernest Clarke, M.D., B.S., F.R.C.S.

Surgeon to the Central London Ophthalmic Hospital.

Since Roosa first drew attention to the association of blepharitis with ametropia, Hall in 1882[2] has published a list of ten cases of blepharitis, in nine of whom ametropia was found to exist, but since then no further statistics have been published. Blepharitis is usually divided into two varieties: (1) the non-ulcerative and (2) the ulcerative; they merge, the one into the other, and the ulceration is nature's effort to get rid of the scabs which form from the increased secretion of the glands. The form of the disease I would specially refer to is the chronic mild blepharitis beginning in early childhood, and sometimes continuing through life when untreated. Careful examination shows that in these cases the disease is practically limited to the facial margin of the free border of the lids, *i.e.*, the most immediate region of the lashes. The skin is here slightly congested, and is covered by thin fine scales, often very small. These "weak eyes," as they are termed, are a constant source of trouble to the patient, for the slightest irritation, such

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[1] Read at the Annual Meeting of the British Medical Association, held at Bristol, July, 1894. We have not considered it necessary to insert the author's tables, which give the refraction and vision in each case.—(Ed.)

[2] *New York Medical Record*, April, 1882.

Ophthal. Review, Vol. XIII., No. 157, Nov., 1894.

as dust or smoke, causes a spreading of the inflammation to the conjunctiva.

The worse form of blepharitis, so common among the children of the poor, called *eczema tarsi* or *sycosis*, often begins with an attack of phlyctenular ophthalmia ; the patients are generally strumous and dirty, which conditions are often considered to be the real cause of the disease, but all such cases I have examined were ametropic, and although the constitutional tendency to eczema, &c., and the uncleanliness may materially "feed" the disease, I believe the asthenopia causes the eyes to be attacked in the first instance.

Analysis of the 100 *cases.*—Cases not picked. In all the disease had lasted over a year, in many all the life. They were all placed under the influence of a mydriatic. Atropine was used for those under 20, and homatropine and cocaine for those over 20.

Taking ametropia to signify a refraction of more than a quarter of a dioptre of astigmatism, any myopia, and more than one dioptre of hypermetropia, *i.e.*, taking it in its broadest sense, every one of the 100 patients was ametropic.

Refraction of the 200 *Eyes.*

Hypermetropia	64
Hypermetropic astigmatism	96
Mixed astigmatism	8
Myopia...	5
Myopic astigmatism	26
Emmetropia	1
	200

Note that in 168 eyes (*i.e.*, 84 per cent., hypermetropia existed in some form. Out of the 200 eyes 194 were either hypermetropic or astigmatic (giving rise to *accommodative asthenopia*). The two cases of myopia in both eyes (7 and 39) had inefficiency of the internal recti (causing *muscular asthenopia*). Forty-one of the patients were anisometropic. In most of the cases the ametropia was of low degree, and out of the 96 eyes in which hypermetropic astigmatism existed, the astigmatism in 72 was not more than ·5D. This is exactly as one would expect it to be; it is just this low form of astigmatism which is most productive of asthenopia.

Sex.—Thirty-five were males and sixty-five females.

Age.—The average age was 17 years.

Occupation.—Sixty-seven of the patients were engaged at near work during most of the day. Forty-four were school children.

Vision before testing.—Eighty-seven of the patients sought advice for "sore eyes" and were unconscious of any defect of vision, and of these sixty-six had with one or both eyes V. = $\frac{6}{9}$ or better, and fifty-two had V. = $\frac{6}{6}$ or better.

To sum up: (1) Blepharitis is essentially a disease of youth, and when we find it present in older patients it has existed since youth. (2) It is an expression of asthenopia, the result of ametropia, which is invariably present. Just as asthenopia shows itself as headache or ocular pain in those whose nervous system is so constituted, so in others, especially strumous patients and those who exhibit a tendency to eczema, does asthenopia mark its presence by blepharitis.

It may be contended by some that 100 normal patients with no blepharitis would have shown the same percentage of ametropia, but this is not so. Work Dodd[1] in his list of fifty people apparently normal, whose refraction was examined, gives out of the 100 eyes twenty emmetropic in the sense I use them above, *i.e.*, 20 per cent.

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[1] *Trans. Oph. Soc.*, vol. xiii., p. 208.

In my list of 200 eyes the proportion of emmetropia was much lower; but even if this were not so, if all eyes were more or less ametropic, my answer is, the proof that asthenopia causes the blepharitis lies in the undisputed fact that case after case which has resisted treatment for years has yielded when the ametropia was corrected, and the patient given glasses to wear constantly; this is the essential part of the *treatment* of blepharitis, namely, to paralyse the accommodation, find the refractive error, and order suitable spectacles. The local application of mild astringent lotions and ointment should be employed of course, and in severe cases epilation and painting with nitrate of silver may have to be resorted to, but no permanent cure can be hoped for until the eye-strain has been removed.

A NEW METHOD OF TREATMENT FOR VASCULARISED CORNEÆ.

By Kenneth Scott, Cairo, Egypt.

Vascularised infiltration of the cornea, quite distinct from pannus, is the condition in which small blood vessels stretch into, and individually ramify across the surface of the cornea; it is very often treated by means of the operation termed peritomy, or syndectomy. This operation, the object of which is, by destroying the continuity of the vessels, to remove the accompanying opacity of cornea, seldom proves a satisfactory means of curing, or even improving the condition of the cornea. By the operation of "peritomy" I include removal of a pericorneal band of conjunctival tissue, as well as the application of the actual cautery around the cornea.

I have nearly always found that an anastomosis, probably at first an inflammatory one of repair, is quickly established, and there is ultimately a recurrence of the original condition.

During the last two and a-half years, I have employed a different method of procedure, with almost always permanently good results. It may be decribed as follows :—The eye having been sufficiently anæsthetised with cocaine, a speculum is introduced between the eyelids, a fair sized magnifying lens is then held in one hand, and with the other all the vessels in the cornea, and as many of their branches as possible, are slit up along their entire length by means of a small Graefe's cataract knife. Each individual vessel having been thus opened along its whole length, it is almost impossible for any anastomosis to be established. This small operation is perhaps a little tedious, but the resulting effects are certainly worth the trouble taken. It is always advisable, on account of the bleeding which obscures the corneal surface, to begin at the margin and work towards the centre of the cornea. The case is treated for a few days afterwards as if it were a simple one of corneal abrasion.

I have tried cauterising the blood vessels along their course with a fine wire point, instead of opening them with a knife, but have never found that the result is so satisfactory, owing, perhaps, to the necessarily greater destruction of corneal tissue and the consequent reaction.

In some of these cases in which both eyes had to be treated, I employed, for the sake of comparison, the slitting operation in one eye and cauterisation in the other ; again in others I have cauterised the vessels over one half of the cornea, and slit the vessels on the other half of the same eye. In this way also I have compared the ordinary operation of "peritomy" with the method I now describe, but the results obtained only the more confirmed my present opinion in favour of the latter.

SIGMUND FUCHS (Vienna). **Investigations into the Electrical Conditions in the Retina after Exposure to Light.** (First Communication.) *Pflueger's Arch. f. Physiol., lvi., p.* 408.

(1) *Objective changes produced in the Retina and Optic Nerve, by exposure to light.*

Up to the present the retina is the only sensory nerve-termination in which it has been found possible to study the objective changes produced by appropriate stimulation. It is, *à priori*, unlikely that these changes are analogous to the stimulus of light in the sense of consisting of waves synchronous with the ether waves; in all probability the ether waves are transformed into molecular motion as heat, or into chemical processes; in both cases under absorption of light. Of the latter changes, we owe to Boll the discovery of the visual purple and the photo-chemical effect of light upon it. Since Boll's early death Kühne and Ewald have enriched our knowledge of this subject very extensively. Boll and Angelucci further discovered changes in the processes of the pigment epithelium, between the outer ends of the rods which Kühne and Sewall followed up more closely by examining the movements and aggregation of the fuscin-needles between the rods of the living retina under the influence of light. Lastly, more striking changes were discovered by van Genderen Stort and Engelmann. These two observers found that the inner ends of the cones become shorter and thicker when exposed to light; the light need not, however, reach the eye directly, it being sufficient to expose to light the other eye, or the surface of the rest of the body only.

The electro-motor behaviour of the retina and optic nerve was first examined by du Bois-Reymond, in 1849. His observations refer, however, exclusively to the current in the *resting eye*, and were almost all made on fishes. The result showed that the transverse section of the optic nerve is negative towards any part of the outer surface of the eyeball, and similarly, that the longitudinal (natural) surface of the optic nerve near the transverse section is negative towards the surface of the cornea.

In 1866, Holmgren, re-examining this question, experimented on frogs in order to ascertain whether a variation in the current could be observed when a light was brought near to or withdrawn from the retina. As he expressly remarks, he wanted to find an *objective* sign of the action of light on the retina. He partly corroborated du Bois-Reymond's conclusions, but found a great difference in his results, according to the part of the surface of the eyeball to which the electrode was applied. When at rest, *i.e.*, not exposed to any change of light, the same part of the optic nerve which was found to be positive towards the posterior part of the eyeball was found to be negative towards the cornea. Of greater importance was his discovery that by sudden exposure of the retina to—or its withdrawal from—light, a change in the strength of the current could be observed; that, in the terminology of Hermann, there existed an action-current.

In a later publication (1871) Holmgren showed that the retina in the state of rest has the same electro-motor qualities as the optic nerve; in the case of the retina the longitudinal section is represented by the layer of nerve fibres and the transverse section by the choroidal ends of the rods and cones. The inner and the outer surface of the retina are therefore in electro-motor opposition.

As regards the changes in the retinal current under the influence of light, Holmgren found for the frog a positive variation in the case of both sudden increase and sudden decrease of light. This variation is a very sensitive test for light and, within certain limits, is proportionate to the difference of the intensities of the light employed. [In all these experiments the greatest care was taken to eliminate any possible muscular currents.] In reptiles, birds and mammals, the variation is negative at the moment of admission, positive at the moment of exclusion of light.

In 1876, Dewar and McKendrick published, as the result of their experiments, an increase of the E.M.F. of 3 to 10 per cent. in the case of admission of light for *all* classes of the vertebrates, and also for crustaceans. Their observations that for coloured light the E.M.F. decreases in the order of yellow, green, red and blue, require, however, a careful re-examination, since the intensities of the various lights used are not given, nor do they seem to have been measured.

In 1880, Kühne and Steiner published their investigations on the electro-motor behaviour of the retina. As far as the *isolated* retina is concerned, they found for the frog that a strong current exists between the point of entrance of the optic nerve and any part of the outer (rod) surface of the retina, the optic nerve being positive; similarly a strong current exists between the optic nerve and the inner (nerve fibre) surface of the retina, the optic nerve being negative; finally, the rod surface is always negative towards the fibre surface. Experiments with sudden exposures to blue, green, red, yellow and white light gave a considerable variation, which was greater for the eye of a frog kept a long time in the dark, than for a daylight-frog. The sudden admission and persistence of light was indicated by a negative variation with a slight positive forerunner, the disappearance of light was marked by a positive variation only. In order to find out how far fatigue influences the difference observed in the retinæ of darkness-frogs and daylight-frogs, both were placed for some hours in a dark room and packed in ice, which retards the regeneration of the visual purple. In the eyes which had lost their visual purple, the exposure to light produced a simple negative variation sometimes introduced by a weak positive variation, and this initial variation increased gradually, but only slightly, in subsequent exposures; in the darkness-frogs the double variation remained unchanged throughout. Experiments showed further that the pigment epithelium possesses no electro-motor qualities whatever.

Similar results were observed on admitting light to the inner or outer surface of the retina. Various experiments which need not be detailed, make it probable that stimulation of the rods alone without the cones is sufficient for the production of the variation.

The E.M.F. of the retinal currents has first been measured by Kühne and Steiner, and is given thus:—

For the darkness-current of the eyeball up to 0·00914 Daniell; for the isolated retina up to 0·00260; for the first positive variation in the eyeball up to 0·00046; for the negative variation in the isolated retina up to 0·00184.

Lastly, the investigations made by Engelmann and Grijns have to be mentioned. Engelmann interpreted the discovery of van Genderen Stort in favour of the theory that the optic nerve has also motor functions. For the demonstration of these centrifugal tracks it was attempted to find out whether exposure of the skin or the eye to light, or electrical or chemical stimulation of the optic nerve, have any, and if so what, influence on the ordinary resting current. They came to the conclusion that the current of the eyeball is caused by two distinct electro-motor forces in the retina, and that the variations are produced by reflex movements of the inner extremities of the cones, but have nothing to do with the process of perception.

(2) *Object and results of the author's investigations.*

It was the author's object not so much to confirm the observations mentioned in the foregoing, as to find out whether, with our present knowledge of the objective changes in the optic apparatus caused by light, it could be proved that the excitation, and consequently the perception of light, actually and measurably occur some time after the stimulation.

His experiments were made on frogs. The animal, kept at least three hours in absolute darkness, was decapitated in a dark room, illuminated only by a weak photographic ruby light. After dividing the optic nerve close to the globe, the eyeball was excised and all the muscular fibres carefully removed. It was then halved by an equatorial section and the retina was placed on an electrode, consisting of a globular mass of salted clay covered with frog's lung (after Engelmann), care being taken that no folding of the retina took place. The other electrode was pointed and so arranged that it could be applied to the other (free) surface of the retina at any point without screening off the light of the electric spark used for the experiments. The whole apparatus was enclosed in a moist chamber, and this again in a light-tight box, while the telescopic reading of the galvanometer was carried out in an adjoining room by an assistant.

The results of these very complicated experiments are best given in the author's summing up:—

The E.M.F. of the unexposed isolated retina was found to be correctly given by the figures of Kühne and Steiner. Equally corroborated were Kühne and Steiner's observations concerning the retina when not exposed to light, viz., that the nerve fibre side is always positive when first connected with the rod side. Soon the current decreases and not unfrequently changes to the opposite direction.

The electric variations take—usually—such a course that exposure to light produces a rapid increase—a positive wave—and an equally rapid decrease of the current—the negative variation. When the exposure to light is suddenly stopped, a positive variation with a return to the position of rest is the result. In some instances exposure to light produced the negative variation alone.

Between the moment of stimulation and that of excitation, as indicated by the electric variation, an interval of time exists which could be measured by Bernstein's rheotome method; it was also possible to measure the duration of the positive initial wave, which reaches its maximum very quickly, and also the duration of the negative variation.

If we may interpret the photo-electric variations as the expression of excitation and consequently of the conscious perception of light, it would follow that this perception is divided by a measurable interval from the beginning of the stimulation. [The following figures will give an approximate idea of these intervals:—Stage of latency of excitation in the retina, 0·0017 sec.; time in which the positive wave reaches its maximum, 0·0069 sec.; duration of this positive wave, 0·0146 sec.; duration of the negative variation, 0·0141 to 0·0242 sec. In the experiments which gave a negative variation only, the duration of its first part was 0·0029 to 0·0105 sec.; while the second part of the negative variation reached its maximum in from 0·0089 to 0·0352 sec.] K. G.

S. BIDWELL. On the Recurrent Images following Visual Impressions. *Proceedings Roy. Soc., lvi., No.* 337, *p.* 132.

The title of this paper is rather too comprehensive, inasmuch as it relates only to visual impressions of very short duration. In fact, the author's observations cover to a certain extent the same ground as those of Hess,[1] to which, as he tells us, his attention was drawn after his paper was written. This is to be regretted, as it is probable that a previous acquaintance with Hess's investigations would have led the author to modify some of his experiments, and might have further led him to a definite determination of some points, in regard to which there are several important discrepancies, and on which therefore his present conclusions cannot be final.

In 1872 Young drew attention to the fact that a spark from a Leyden jar seen in a dark room seemed to reappear two or three times after very brief intervals. This phenomenon he called "recurrent vision." Soon after this some experiments on the same subject were published by Davies, who observed that the recurrent images of coloured lights were very nearly of the complementary colour, except in the case of red, which showed no recurrent image at all.

In 1885 the author showed that the phenomenon of the recurrent image could be demonstrated in an easy manner by rotating a Geissler tube around one of its extremities. On looking at the centre of rotation the eye perceived a faint steel-grey image—a "ghost"—following the lighted tube. In the case of a sudden flash of the arrested tube an intensely black image followed instantaneously, and was quickly replaced by a luminous image, which soon disappeared. The comment given then by the author that "the series of phenomena seem to be due to an affection of the optic nerve, which is of an oscillatory character," is of course no explanation, and there is nothing to show that the affection is localised in the nerve rather than in any other part of the sensory tract.

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[1] On After-images which follow brief Excitations of the Retina (OPHTHALMIC REVIEW, Oct., 1894, p. 319).

Charpentier, who seems to have been ignorant of Bidwell's observations, found in 1891 that when an illuminated sector is rotated round an axis fixed by the observer's eye, the leading edge of this sector is followed by a sharp dark band. He gives the following summary of his results: It would be difficult, and in any case premature, to indicate the cause of this phenomenon, but it may fairly be characterised as the result of a retinal oscillation set up under the influence of the beginning of the luminous excitation.

For the purpose of re-examining and enlarging the results just mentioned, Bidwell made various experiments. He first made a disc of coloured light (a spectral colour reflected by a rotating mirror) describe a circle on a screen, and noticed that with a rotating velocity of $\frac{2}{3}$ sec. the "ghost" appeared about 50° behind the disc, giving a time interval of about $\frac{1}{5}$ sec. The colour of the ghost was nearly (but not quite) the complementary colour of the disc, except in the case of red, where no ghost was seen at all. When the coloured disc was replaced by a whole spectrum, the ghost was distorted, having its brightest part near the middle of the green, while both its ends were shortened and curved away from the spectrum. This was principally the case at the less refrangible end. The ghost was of a *violet* hue in all its extent. The attempts of the author to account for this violet colour do not appear satisfactory. In the experiments made by Hess the positive after-image of the spectrum (=the "ghost" of Bidwell) was seen colourless; to account for this violet hue, therefore, seems to us to require a more exhaustive investigation than that given by the author, before any conclusion can be accepted. In connection with this question the following experiment was made: On one and the same spot of the screen two spectral colours, red and green, were projected by two lanterns. The intensities of both coloured patches could be regulated, so that the resulting colour on the screen could be varied from pure red to orange, yellow, yellowish-green, green. The pure spectral red gives no ghost, the spectral green alone gives a violet ghost. The question was whether the green with the inert red would give a ghost corresponding to the green alone, or rather to the compound colour formed by the various combinations of green and red. This latter was really found to take place, just as though the combined colours had been simple spectral colours.

If this latter experiment proves anything at all, it shows that the perception of colours by the eye is a physiological act, and not a physical analysis such as is caused by a prism or a diffraction grating. We cannot, therefore, accept the author's conclusions that in all probability the blue and bluish-green colours of the ghost, when the yellow and orange portions of the spectrum are tested separately, are due "merely to an effect of mental judgment, and not to any cause of a physiological nature."

Further, is it a "fact," as the author states, that "with white light the recurrent light is violet"? It would be necessary first to state what "white" has been taken. Had that white light any admixture of colour? Again, was the eye thoroughly adapted by rest after each experiment? Further, how far can fluorescence of the refracting media, how far can colouring of the lens and of the yellow spot in the individual observers of various ages be made responsible for any apparent discrepancies? Some of these latter causes for differences in results have been mentioned by Hering, who is considerably senior to Hess.

It is clear that a great deal of careful work will still be required before we are able to interpret correctly all the observations given in this interesting paper. We add here in the author's words the order of the visual phenomena as recorded by him :

(1) Immediately upon the impact of the light there is experienced a sensation of luminosity, the intensity of which increases for about $\frac{1}{60}$ of a second; more rapidly towards the end of that period than at first.

(2) Then ensues a sudden reaction, lasting also for about $\frac{1}{60}$ of a second, in virtue of which the retina becomes partially insensible to renewed or continued luminous impressions. These two effects may be repeated in a diminished degree, as often as three or four times.

(3) The stage of fluctuation is succeeded by a sensation of steady luminosity, the intensity of which is, however, considerably below the mean of that experienced during the first $\frac{1}{60}$ of a second.

(4) After the external light has been shut off a sensation of diminishing luminosity continues for a short time and is succeeded by a brief interval of darkness.

(5) Then follows a sudden and clearly-defined sensation of what may be called abnormal darkness—darker than common darkness—which lasts for about $\frac{1}{60}$ of a second, and is followed by another interval of ordinary darkness.

(6) Finally, in about $\frac{4}{5}$ of a second after the extinction of external light, there occurs another transient impression of luminosity, generally violet coloured, after which the uniformity of the darkness remains undisturbed.

K. G.

A. WAGENMANN (Jena). A Study of the Pathological Anatomy of Embolism of the Central Retinal Artery. *v. Graefe's Archiv, xl.*, 3.

Wagenmann's aim is to find an uncomplicated case of embolism of the central artery. A case reported by Manz is rejected because inflammatory glaucoma supervened ten months after the embolism, and besides the eye showed many *post-mortem* changes under the microscope, owing to its having been enucleated twenty-four hours after death. Another case is spoken of at length, which was reported by Elschnig in the *Arch. für Augenh.*, vol. xxiv., No. 2. In this case the patient, a woman 50 years old, died forty-seven days after the onset of the embolism. Elschnig found well-marked degeneration of the retina, especially in the macular region, where it could be recognised even microscopically. The fovea centralis had disappeared; at this point the retina was firmly adherent to the choroid. At the centre of the macular region the layer of rods and cones, as well as the external limiting membrane, had entirely disappeared, and the much thinned retina consisted of two sharply differentiated layers—an inner one consisting of fine interwoven fibrillæ containing many small vessels; an outer made up of the remnants of the outer nuclear layer, large epithelioid cells, and pigment cells. The retina was thus transformed into an inner vascular and fibrillar layer, and an outer rich-celled layer of young connective tissues. The pigment epithelium about this point was also changed, partly atrophic, partly thickened, and in places covered with a thin layer of albumen.

In the periphery, Elschnig found two spots in which the layer of rods and cones and the external limiting membrane were absent. At these points the pigment epithelium was much thickened and traversed by vitreous lamellæ. Some pigment cells had found their way into the retina. Elschnig's explanation of these changes, as due to the disturbance of lymph circulation in the choroid by the embolism, is not accepted by Wagenmann, who regards them as typical spots of old choroiditis, and believes they preceded the embolism. Besides, forty-seven days, he thinks, is too short a time for the formation of vitreous lamellæ.

Wagenmann believes the case of embolism which he describes to be an uncomplicated one, and he has not been able to find the same conditions as Elschnig.

The details are as follows: Patient, a woman, aged 45, discovered, on waking, that her right eye was totally blind. Five days later she was admitted to the Heidelberg ophthalmological clinic. Examination showed appearances characteristic of recent embolism of the central artery, with several small hæmorrhages near the papilla and in the yellow spot region. Radial pulse very tense and irregular, mitral insufficiency, left dry pleurisy, and extensive lung changes. Careful massage and inhalations of amyl nitrite were of no avail. A few days later a small spindle-shaped hæmorrhage was detected down and in from the disc, in the otherwise quite normal left eye. As the retinal haze cleared, the right optic atrophy became more and more evident. After a few days pulsation reappeared. Parts of the arteries were changed into yellowish cords, but in all the principal branches a column of blood, even though very slender, could be seen.

The patient was seen frequently. A year later she was taken into the medical ward on account of her cardiac trouble, and three weeks subsequently she died. The eye was enucleated eight hours after death. The *post-mortem* report was: Cardiac hypertrophy, also endocarditis mitralis, brown induration of the lungs, engorged spleen, granular atrophy of the kidneys with hæmorrhages, hæmorrhages in the stomach, intestine, mesentery, renal pelvis and liver capsule. Eye hardened in Müller's fluid. The embolus was found just behind the lamina cribrosa, almost completely occluding the artery. Only a small slit-like lumen can be seen, which in some places touches the former vascular wall, in others lies wholly in the embolus, contains red blood capsules, and is surrounded by several layers of endothelium. Where the plug is situated the central artery is much distended—it is quite twice the normal width. On both sides of the plug the lumen of the central artery is much diminished by proliferating intima cells, and moderate thickening of the other coats.

The plug cannot be sharply defined, as proliferating cells, mostly from the vascular wall, have grown through it and organised it. Fine fibrillæ also traverse it and here and there are large fatty cells and fine detritus. Fat and cholesterin crystals, some of them surrounded by a band of polynuclear, giant-shaped cells, are present as an indication of retrogressive metamorphosis. Over considerable distances the plug is thinner and traversed by cavities in the neighbourhood of the vessel-wall, as though the firmer body of the plug had been retracted, or the loose masses deposited by coagulation. The intima shows irregular proliferation; the muscular coat is preserved throughout, but in some places shows thinning, in others cellular infiltration and connective tissue degeneration. The remainder of the wall is everywhere thinned, the surrounding connective tissues considerably thickened.

In view of the age of the plug, its fusion with the vascular wall is not surprising. Had it been, as in Manz's case, a piece of calcified tissue, it could have been easily differentiated even after a long time.

The presence of a blood-filled lumen is worth notice, as showing how circulation is re-established. Schnabel and Sachs have pointed out that circulation may be temporarily suspended by a non-occluding plug causing a contraction of the vessel-wall; when this contraction passes off, the blood can again pass the plug, and thus re-establish a diminished circulation. Wagenmann, appreciating this point, mentions three possible ways in which the circulation may be re-established: "an occluding plug may be reduced in size by the contraction of the vascular wall; shrinking of the plug may partly free the lumen; the vessel expands through ischæmic paralysis." The second and third possibilities are the probable ones in this case, as

Wagenmann does not think that such a soft plug could have distended the artery to such an extent, and the peripheral cavities speak for shrinking.

The peripheral portion of the optic nerve is quite atrophic. The connective tissue septa are thickened and lie close together. Besides numerous unchanged small vessels and capillaries, there are many vessels with marked changes in the walls, hyaline degeneration, endarterial proliferation and occlusion of the lumen. Two small arteries in the pial strata are completely occluded by a fibrous mass containing fatty cells, crystals, and detritus; as though here, too, embolism or secondary thrombosis had taken place. The farther up we go, the less marked are the vascular changes in the optic nerve. The wall of the central vein shows uniform connective tissue thickening; the lumen is free, although constricted.

The ascending atrophy of the optic nerve is almost complete, only a few fibres taking Weigert's stain. The intervaginal space is dilated throughout.

The optic disc is extremely atrophic, the lamina cribrosa slightly convex backwards, and covered by a thin layer of connective tissue, the sole vestige of the papillary tissue.

The retinal changes are very characteristic and uniform throughout. It should be remembered that the amaurosis was complete. The outer retinal layers are well preserved, the inner layers quite atrophic and reduced. The pigment epithelium is not at all changed, and lies on the choroid as in the normal eye. In the macular region, also, the pigment is quite intact. The author lays particular stress on this, on account of the finding of Elschnig, who even speaks of a very flat, ophthalmoscopically imperceptible detachment of the retina.

The outer nuclear layer is normal, except for occasional vacuoles, and none of the nuclei have passed through the limitans externa, as in Elschnig's case. The outer granular layer is quite atrophic, so that the two nuclear layers almost touch. Only in the macular region is the interfibrous layer a little wider. The inner nuclear layer is reduced to a single row of easily stained nuclei. The inner granular layer, the ganglion cells, and the nerve fibre layer are altogether absent, and are represented by a thin layer of retinal supporting tissue only, in which an occasional tissue nucleus and some detritus can be seen. The vessels are surrounded by a small amount of fibrillar tissue; the lymph cavities are strongly distended, nerve fibres are not visible anywhere. Close to the ora serrata the common cystoid degeneration is seen. In the yellow spot region the thinning, instead of being pronounced, seems less, especially at the fovea itself, where the retina appears to have an almost normal thickness. The cones are well preserved, and at the margin of the fovea, the outer nuclear layer increases rapidly in width, but the nuclei are slightly irregular, and are separated by a few fine fibrillæ. The inner nuclear layer in the neighbourhood of the fovea is composed of three rows of nuclei (in distinction to the one row found in the other parts), over which some thickened and fine granular tissue lies. The inter-fibrillar layer is well preserved, only the fibres are collected into bundles, between which lie vacuoles. At this point the outer nuclear layer, also, is divided into two parts by vacuoles. Perhaps this means chronic œdema: if it does, it is the only sign of œdema in the retina.

All the retinal vessels present marked constriction of the lumen, due principally to proliferation of the endothelium. The other coats are also thickened, and show hyaline degeneration. Some small arteries are entirely obliterated, but all the larger ones contain some blood. The veins also present thickening of the walls and hyaline degeneration, most markedly in the neighbourhood of the papilla. To this condition Elschnig has applied the name arteritis and phlebitis proliferans; it is a sequence of the temporary complete suspension, and the chronic diminution of the circulation.

In the choroid there are only slight changes, notably of the vessels, some of the smaller ones exhibiting increase of the inner coat, leading at times to complete obliteration, and hyaline degeneration of isolated cells or of the whole wall. The embolism must not be held responsible for these changes; they are to be regarded as a local expression of the general vascular disease.

M. W. FREDRICK.

E. HERING (Prague). Investigation of a Case of Total Colour-blindness. *Pflueger's Archives of Physiology, xlix., p.* 563.

The investigation was undertaken with a view to verifying Hering's theory of colour-vision, and especially to ascertain whether it was possible in accordance with it to predict the particular black-white mixture which, to the colour-blind eye would seem to be identical with any given colour. This had been impossible, in accordance with the Young-Helmholtz theory; if it could be done by Hering's theory, it would give additional support to the latter.

According to Hering, every optical impression can be analysed into a white "valency," and a two-colour valency. In the case of one of the four primary colour sensations (red, green, yellow, blue), only one colour valency exists besides the white valency, and in neutral (colourless) sensations, the white valency alone is present.

The greater the white in proportion to the colour valency, the less saturated is the colour sensation. The measuring of the white valency is easy for the totally colour-blind eye (if vision be sufficiently good), but difficult for the normal eye. Two methods can be adopted for the examination of the white valency:—(1) Using the peripheral (colour-blind) portion of the retina, or (2) reducing the intensity of coloured light and examining with an eye adapted for darkness. In such an eye Hering found the sensitiveness for the white valency increased, but for the colour valencies the same as in an eye adapted for light. Hence coloured light, when of minimal intensity, is seen as colourless light on a dark ground, until with increased intensity its peculiar colour becomes recognisable.

In examining a spectrum in this way, the greatest value of white valency is found in the green of the lines E and b, and not in the yellow. On the other hand, the brightness of a colour sensation depends not only on the white but also on the colour valency, and all the more so the more saturated the colour is. Red, and still more yellow, act in this respect as increasing the brightness; green, and still more blue, have the opposite effect of darkening.

Red, yellow and white, are therefore to be considered as colours of dissimilation; green, blue and black as those of assimilation.

Various paths lead to such a conclusion. Here is one given:—A blue disc is placed on a large grey disc, both colours being of the same white valency, so that they appear identical to the eye adapted for darkness. The blue disc is then partly covered by a grey sector of the same grey as the large disc. Then both discs are rotated. To the unadapted eye the smaller disc appears all the more blue and at the same time darker the greater the blue sector is; while to the eye adapted to darkness, both inner and outer disc appear equally bright, whatever the proportion of the blue to the grey sector may be.

Another mode of experimenting was as follows:—One half of the field of a small telescope was lighted with homogeneous yellow of a certain wave-length, the other half with the complementary blue, so selected that both colours when combined gave white. When both colours were sufficiently darkened to appear colourless to the eye adapted for darkness, the previously yellow half of the visual field appeared much darker than the other (previously blue) half, &c., &c.

The examination of a colour-blind individual (a music teacher, aged 20, with vision of $\frac{6}{24}$ of both eyes, when corrected for astigmatism), showed that both retinæ were totally colour-blind in all parts. The red end of the solar spectrum was considerably shortened, being visible only to the line C, as compared to the line A for Hering. At the violet end no shortening was found, in fact, the colour-blind patient saw there in reduced light more easily than Hering himself.

The brightest part of the spectrum was found to be between the lines E and b. These results are in complete harmony with the theory which would lead us to expect (1) a shortening at the red end—the brightness of the red being due, not to the white valency, but to the coloured valency, completely unperceived by the colour-blind eye; (2) no shortening at the violet end, the blue and violet valencies having a darkening effect; (3) the greatest brightness at the lines E and b, in the green part of the spectrum, where the white valency is greatest.

Experiments with the rotating discs, and with coloured glasses in the polarisation-photometer showed that the equations were practically identical for the totally colour-blind eye, and for the normal eye after adaptation for darkness.

Experimenting with spectral colours it was found that any two spectral colours could be made to appear alike by adapting their individual intensity; *e.g.*, a light red and a dark green appeared alike, also a brilliant yellow and a dark blue, &c. These examinations, made in a variety of ways, all showed that the curve of the white valencies of the spectrum is the same for the totally colour-blind and for the normal eye.

In conclusion, Hering considers in critical review, how far the Young-Helmholtz three-colour theory harmonises with these facts. Of the curves drawn by Helmholtz and others for their three primary colours, red, green and violet (or blue), only the "green" curve approximately resembles Hering's curve of the white valencies of the spectral colours. If we should therefrom conclude that the totally colour-blind eye sees the spectrum actually green, the following objections would stand in the way of such a conclusion:—

(1) In a well-described case of one-sided and almost total colour-blindness, everything was perceived as colourless, not as green.

(2) In cases of acquired monocular or double total colour-blindness, everything is perceived colourless and not green.

(3) The periphery of every normal eye perceives coloured objects not as green, but as colourless.

In all these cases the colour "green" is perfectly well known to the individual, and with it the difference between green and "colourless" light, *i.e.*, white.

In no case can the three-colour theory account for the remarkable coincidence of the curve of the white valencies for the normal eye with that of the intensities for the totally colour-blind eye, while the theory of Hering gives a ready explanation of it. K. G.

E. HERING (Prague). A Case of Blue-Yellow Blindness. *Pflueger's Arch. f. Physiol., lvii., p.* 308.

In the forty-eighth and fifty-seventh volume of Pflueger's *Archives*, Professor von Vintschgan gives a very detailed account of the examination of a case of blue-yellow blindness. The sufferer, an Italian gentleman, was induced to travel with Professor von Vintschgan to Prague, for the purpose of completing the examination as much as possible with the help of the apparatus in Professor Hering's Physiological Laboratory. As von Vintschgan describes the result of the subjective examination only without reference to any theory of colour vision, Hering, who subjected the patient to various examinations, gives an account of the case in its bearings on his colour sense theory.

A deficiency in the colour sense may be quantitative or qualitative. If quantitative, the only case of practical importance is the one where the stimuli of the various homogeneous lights of the spectrum have a different value from what they have in the normal eye. As an example of this state an excessive pigmentation of the lens or of the yellow spot may be mentioned. [Hering applies the term "optic valency," *i.e.*, value of optical excitation—optischer Reizwerth—to the power of producing the sensation of a certain coloured or colourless light. Since this power varies according to the excitability, the of the eye, the only possibility of comparing various examinations will be to find a state of constancy for the excitability. This is given for a normal healthy eye by a long rest under exclusion of every external light, or, as Hering calls it elsewhere, by the adaptation for darkness.]

In a case of purely quantitative anomaly of the colour sense, a homogeneous light produces the same sensation as it would do in a normal eye if, before entering it, its energy or we may say its intensity, had been modified—decreased or increased, as the case may be.

In a case of qualitative anomaly no modification of the energy of a homogeneous light is capable of producing the same sensation as in a normal eye. It produces a sensation which in the normal eye is produced by light of a different wave-length, or by a combination of light of various wave-lengths.

Hering's theory divides all colour sensations into three optic valencies: a white, a blue-yellow, and a red-green primary valency. In the case of qualitative anomaly of the colour sense, either one or both colour valencies can be reduced; if one of the colour valencies is missing, we have partial colour blindness, if both are absent, total colour blindness. With a qualitative anomaly a quantitative one may co-exist, but while the latter may prevail for certain homogeneous rays only, a qualitative anomaly must necessarily affect the whole spectrum to a certain degree, since every colour sensation—except the primary sensations themselves—can be resolved into the three primary valencies.

The individual case under consideration, like all others which have hitherto been examined sufficiently minutely, falls in with the theory. It shows a complete absence of the blue-yellow valency, also a reduction of the red-green valency, in other words blue-yellow blindness and weakness of the red-green sense. Besides this there exists also a quantitative reduction of the sensitiveness to rays of short wave-length (violet, blue, and partly green).

If we construe from theoretical considerations the appearance of the spectrum for an eye with uncomplicated blue-yellow blindness—hitherto not yet observed—it is clear that in all spectral colours the blue and the yellow components have to be eliminated ; hence we should find primary red (a red without any apparent admixture of yellow) becoming gradually less saturated and turning into grey or white at a place where the normal eye perceives primary yellow. This is the first so-called neutral spot from which through increasing degrees of saturation of green, the primary green is reached. This is again continued through decreasing saturation into grey or white at the place where the normal eye sees the primary blue, the second neutral spot ; beyond this red appears again to the end in weak saturation.

In the case under consideration, an additional reduction of the red-green valency which co-exists, would have the following result : In those homogeneous rays which have only a very small amount of red or green valency, the latter would remain below the limit of perception altogether, and in all other cases red and green would appear less saturated than if the red-green sense were intact. Hence the red end of the spectrum would be shortened; and both the first and the second neutral spots would appear not as a narrow line of grey or white, but would be extended on both sides as a colourless zone in which the red and the green valencies also respectively remained below the limit. At the more refrangible end of the spectrum which would be perceived as red, no shortening would take place owing to the great white valency of the violet rays.

There is, however, a third anomaly to be considered in this instance, viz., a quantitative reduction of sensitiveness for the more refrangible rays. These appear darker, and thereby not only is the spectrum shortened at the more refrangible end, but the red component of the violet rays thereby usually remains below the limit. By experiments it was demonstrated that the violet rays were perceived, presumably as diluted red.

The diagnosis of qualitative anomaly in the perception of colours was proved in various ways. One half of a round or square field was illuminated by colourless light, the other half by yellow or by blue light. By regulating the intensity of each half, they could be made to appear identical to the patient, and equally so if the one half was made blue and the other yellow.

If, on the other hand, red and green were substituted for yellow and blue, no equalisation could be obtained; neither for red and green together, nor for either of them with a colourless light. It was thence concluded that the blue-yellow valency was not acting.

At the same time it was noticed that equalisation could be effected with blue and yellow lights, which showed to the normal eye a certain admixture of red and green respectively, indicating thereby that the red-green perception was somewhat reduced as well.

Further, when the patient had to equalise spectral yellow and spectral blue rays, of which in his case only the white valencies were perceived, it was found that he required a surprisingly great intensity of the blue light in order to be able to match it with the yellow. Experiments made with Helmholtz's spectrophotometer showed that for Hering's eyes the white valency of light of 475 λ was double the white valency of light of 575 λ. In the case of the patient the white valency of light of 475 λ was reduced to half that of the normal eye. This reduction was not confined to light of 475 λ only—in which case the spectrum in that part would have appeared to him a dark band—but was found to reach into the blue-green part of the spectrum.

As for the spectrum the following was found :—

The red end was shortened. This is explained by the reduction of the red-green sense. The red rays at the end of the spectrum have a minimal white valency, and owe their luminosity principally to their red valency, to which a small amount of yellow valency is added. This latter being missing for the patient, and his red sense being reduced, a shortening of the spectrum at the red end must necessarily be the result.

The violet end of the spectrum also appears shortened to the patient on account of the quantitative anomaly of his colour sense.

He sees in the spectrum whether it be a subjective or an objective one, only two colours, viz., red and green, separated by a colourless band in the region of the yellow. The "purest" green was seen at about 532 λ. Owing to his reduced red-green sense the green was succeeded towards the more refrangible end by a colourless shortened band. 481 λ was the furthest limit for the recognition of green. The colourless part between red and green as measured by Helmholtz's spectrophotometer extended from 598 λ to 568 λ. By the side of light reflected from the sky which in the instrument appeared colourless, light 619 λ to 605 λ was recognised as red; from 601 λ to 571 λ it appeared as grey, permitting equalisation with reflected skylight; light of 570 λ appeared coloured and was called "yellowish," from 566 λ distinctly green to 488 λ; from 485 λ colourless, from 472 λ "dark grey," from 440 λ "almost black." From 485 λ equalisation with reflected skylight was also possible.

The presumption that the rays beyond the primary blue had a red valency for the eye of the patient, although he never called them red, was proved to be correct in three various ways:—

First.—The red perception of the patient being below the normal, it was easily possible to light the field of a telescope with a homogeneous red of so weak an intensity that it appeared colourless to the patient, while yet clearly red to the normal eye. By slightly increasing the intensity he recognised it as red. The field was then lighted by homogeneous violet light only, which appeared to him as grey. Then the weak red light of before, which was below his limit of recognition, and the violet light were both allowed to fill the field together, with the result that the patient declared he saw a grey with an undoubted admixture of red. Thus the two red valencies of the weak red and of the violet when combined reached a value that brought them within the limits of perception. Similarly the combination of an orange of certain intensity and a blue violet, both of which he called grey, produced when combined a "dirty red."

Secondly.—A green light could be mixed with a red one so as to produce a colourless mixture. Provided then that violet contained any red valency for his eye, it should be possible to change a green light into a colourless light by a sufficient admixture of violet. This could be accomplished by experiment, care being taken to avoid any wrong conclusion which might result from simply "diluting" the green by increase of the white valency.

Thirdly.—The existence of the red valency for the patient's eyes could be proved to exist in violet rays by experiments based on the production of simultaneous contrast.

In all these experiments and observations not one fact was observed which seemed to contradict Hering's theory of colour perception. K. G.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, NOVEMBER 8, 1894.

STEPHEN MACKENZIE, Esq., M.D., Vice-President, in the Chair.

Lamellar Cataract and Rickets.—Mr. Treacher Collins read a paper on "Lamellar Cataract and Rickets." He pointed out how the opinion of Davidson and Homer, published in 1865, that lamellar cataract was the result of rickets, though widely accepted on the continent, was not even referred to in a large number of the text-books on eye disease in this country. He then read several communications from physicians and ophthalmic surgeons, collected for him by Dr. Barrett, of Melbourne, and Dr. Symonds, of Adelaide, as to the relative frequency of these two diseases in South Australia. The evidence thus obtained went to show that in Adelaide rickets is a very rare disease, and lamellar cataract very unusual. In Melbourne rickets was, until recently, comparatively rare; it is more common now, but the severity of the affection is much less than in the old world. Lamellar cataract is exceedingly rare, and the honey-combed condition of the enamel of the teeth is not often observed.

In Sydney, the oldest city in Australia, rickets is said to be as common as in England, but he had no information as to its comparative severity. Lamellar cataract is less frequent than in this country. In a recent visit he had paid to Persia, Mr. Collins had endeavoured to ascertain the amount of those two diseases there. He was assured by the medical men he met that rickets is uncommon; the conditions of life, moreover, are not such as are usually considered likely to favour its development. Amongst a very large number of eye patients whom he had seen in that country, there was only one case of lamellar cataract.

Mr. Marcus Gunn said it was still a moot point whether the condition of lamellar cataract was brought about by changes before or after birth. The decision of this point would have an important bearing on the question of association with rickets.

Mr. Jones, who had spent twelve months as house surgeon, and three months as ophthalmic house surgeon in Australia, said that he had seen no case of lamellar cataract or of rickets there.

Mr. Sydney Stephenson stated that he had examined all the new comers to one parochial school, in all about 5,000 children, and that among these he had only found four cases of lamellar cataract, the striæ being very delicate and easy to overlook. Rickets was very common, and its effects were readily discerned in children of 5 or 6 years.

Mr. Silcock referred to the President whether both conditions might not be due to one common cause.

Mr. Power said that many lamellar cataracts were congenital, and belonged to a period antecedent to that at which rickets occurred.

Mr. Lang contended that the changes in the lens involved the entire nucleus as well as the periphery, and that this as well as the development of the enamel, dated from before birth. He thought the whole change was ante-natal.

Mr. Marshall thought that the occurrence of fits, lamellar cataract and defective development of the enamel being in each case referable to abnormal change in the epiblast, was probably associated with some ante-natal defect in the central nervous system.

Mr. Lawford, referring to the interference with the growth of the enamel occurring after birth, quoted the domestic cat as being sometimes the subject of lamellar cataract. Similar changes in the eye of the rabbit, as observed by Bowman, were quoted by Mr. Lang, and in the eye of the Australian bear, by Mr. Marcus Gunn.

The President said that observers had not yet paid much attention to the association of lamellar cataract and rickets, and he was not sure how far such a connection was established. He knew of no common cause of this condition and changes in the enamel organ. It was difficult to say whether the opacities in the lens were developed, or only discovered after birth.

Mr. Treacher Collins, in reply, said that though most of the speakers appeared to dissent from the proposition involved in his paper, none had attempted to explain the absence of both conditions in Australia. Rickets was to a great extent an evanescent disease, and its traces could not always be expected to be recognised in the subjects of lamellar cataract. The mode of development of this latter condition was little known, as attention was only called to the lenses when the sight had become markedly defective. Calcification of the permanent teeth occurred about the third year of life, that is to say, about the time that rickets prevailed. He met the suggestions of cataract in the lower animals by quoting Mr. Bland Sutton's observations on rickets in males.

Complete Ankylo-blepharon.—Mr. Kenneth Campbell (Cairo) communicated a paper on this subject. The patient, a native of Upper Egypt, aged 50, presented himself with a large rounded tumour which completely masked the right orbit. There was no evident appearance of palpebral fissure. The swelling was dull red and shiny, with some large veins on the surface, and measured laterally 4·8 cm., vertically 3·2 cm., and projected forward 3·2 cm. from the orbital margin; it was tense, but fluctuating, and moved co-ordinately with the lid of the other eye. The man stated that the sight had been lost since childhood, and that the swelling had appeared before on more than one occasion, but had subsided under poultices. A minute examination disclosed a trace of palpebral slit, without eye-lashes, at the extreme lower margin of the tumour, and the opinion was formed that the case was one of complete ankylo-blepharon with retained and probably semi-purulent lacrymal secretion. This was confirmed on the day preceding that fixed for operation by the perforation of the skin in the centre of the upper eye-lid, attended by escape of semi-purulent fluid and total collapse of the tumour. The palpebral slit was re-opened and the conjunctival sac dilated to obviate recurrence, but no attempt was made to re-establish the lacrymal channels owing to the great alteration of the parts by cicatrisation.

THE OPERATION OF ADVANCEMENT IN SQUINT.

By Richard Williams, M.R.C.S.

Senior Surgeon to the Liverpool Eye and Ear Infirmary; Ophthalmic Surgeon to the Royal Southern Hospital, Liverpool, and to the Royal Albert Edward Infirmary, Wigan.

RECENT discussions at the Ophthalmological Congress and elsewhere have, I think, clearly shown that in future the rectification of strabismus by tenotomy alone, as it has been practised until recently, is likely to be superseded, to a large extent at least, by advancement, either with or without tenotomy of the opposing muscle. Although I have been a believer for several years in the more frequent use of advancement, it is not my intention in this communication to advocate the claims of either the one or the other procedure in the treatment of squint generally; but as the surgeon is necessarily influenced in his choice of operation not only by the results obtained, but also by the facility with which the operation itself can be performed, and believing that advancement would be much more frequently undertaken if ophthalmic surgeons generally had at their disposal a simple and at the same time an effectual method, I venture to republish, somewhat more in detail, a plan of operation which first appeared under my name as far back as 1887.[1] Since the method

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[1] *British Medical Journal*, 1887.

Ophthal. Review, Vol. XIII., No. 158, Dec., 1894.

about to be described was first conceived, I have operated on a very large number of cases, both convergent and divergent, and I can truly affirm that no case of non-paralytic squint need turn out a failure. The facility with which the operation can be performed is such that I never hestitate to undertake it whenever advancement seems advisable. The irritation and subsequent swelling caused by the presence of a single stitch are so slight that they subside in a comparatively short time, and ultimately disappear so completely that no trace of any interference can be detected. Judging from conversations I have had with extremely competent operators, and also from some public utterances, this cannot be said of other methods commonly in vogue, the result being that tenotomy is often preferred in cases where advancement is really indicated. And perhaps this is not to be wondered at when one hears of half an hour or more being occupied in a procedure which ought not, under ordinary circumstances, to take more than five minutes.

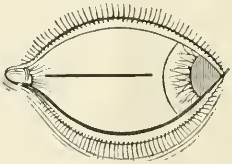

FIG. 1.

No special instruments are necessary for the performance of the operation, a speculum, pair of forceps, an ordinary squint hook, needle and thread, and a pair of scissors being all that is required.

The eye having been cocainised in the ordinary way, and the speculum inserted, an incision is made in the conjunctiva from the margin of the cornea in the direction of the canthus along the muscle to be operated on (fig. 1). The conjunctiva is then separated from the sclerotic on each side of the incision for a short space. An opening is next made in the capsule near the insertion of the muscle. The hook is now inserted under the tendon on one side, and brought out on the other, where it is seen to emerge covered with the capsule. By a snip or two of the scissors the point is liberated and brought out. The hook is then confided to an assistant. As the next step the surgeon seizes the conjunctiva near the margin of the cornea on either side of the incision, and the needle is passed under that membrane for some distance beyond the insertion of the muscle. If a strand of the surface of the sclerotic near the corneal margin is included, so much the better. The needle having been brought out, the forceps seizes the body of the muscle, as near the canthus as may be necessary in each individual case, and the needle is passed through it from side to side *at right angles to the direction of its fibres.* It is then carried under the conjunctiva of the opposite side and brought out at the margin of the cornea at a point corresponding to the point of entrance. A glance at fig. 2 will show the course the needle and thread have taken. The tendon and conjunctiva are thus held in a single loop. The tendon is now cut across at its insertion, care being taken not to cut the thread. The muscle is seen immediately to

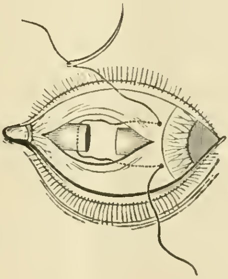

FIG. 2.

retract, carrying with it the bend of the loop. The two ends of the thread are now carried over the nose, and there held by the assistant, while the operator divides the opposing muscle. This muscle should never be cut until the other steps of the operation have been completed, as its action materially helps the operator. The last step of the operation—to tie the knot—is perhaps the most important of all. It should be done slowly and gently, the eye being pushed, as it were, towards the muscle, and the two ends of the thread being drawn on the points of the two index fingers until the knot is brought thoroughly " home." At the completion of the operation there ought to be a decided deviation in a direction opposite to the original squint, otherwise the result will be insufficient. A stitch may or may not be put in the conjunctival incision—it is not necessary. A pad and bandage are now applied, and the patient is directed to keep his eyes as quiet as possible, more for his own comfort than on account of any danger to the success of the operation. At the end of four or five days the stitch is removed, and the eye rapidly resumes its normal aspect.

In conclusion, I may say a word or two on the objections which have been advanced against this method.

(1) The puckering of the tendon which necessarily takes place in tying the knot. This is a purely theoretical objection, and has no influence upon the result. (2) That an unsightly swelling of the conjunctiva is produced at the seat of operation, resembling episcleritis. A certain amount of swelling is, no doubt, brought about, but it is never permanent, and generally disappears altogether in a few weeks. (3) That ulceration of the cornea may be caused by the presence of the stitch. I have never seen such an accident, and it is not easy to understand how it can be produced, seeing that the knot *ought never* to encroach upon the cornea. Indeed, it is obvious that such a state of things would be

fatal to the success of the operation, inasmuch as no adhesion of the tendon can take place beyond the limits of the sclerotic. Therefore the knot should never be situated beyond the sclero-corneal margin. In nearly all cases there is some dragging of the conjunctiva over the margin of the cornea on each side, but this is a matter of no consequence, as it falls back into its place in a few days and gives no further trouble.

S. E. HENSCHEN (Upsala). Hemiopic Pupil Reaction. *From Klin. und Anat. Beiträge zur Pathologie des Gehirns, Theil iii.*

In this article an analysis is given of thirty-six cases of intra-cranial lesions bearing on the subject of hemiopic pupil reaction. That in lesions of the tract the pupillary reflex must suffer simultaneously with the light sense was shown by Wilbrand in 1881, but it was Wernicke who in 1883 on *a priori* grounds concluded that the pupil reaction can determine whether a lesion in the tract is situated before or behind the place where the pupillary fibres pass from it to their centre. This reaction has been accepted as diagnostic by various authorities, but few cases are on record in which it has been observed. Henschen observed one case in 1886, which was published by him along with two others in 1889, Martius records one 1887, and Seguin three in the same year, all without autopsies. The first case, in which a *post-mortem* was made, was published by Schmidt-Rimpler in 1888, the next by Henschen in 1889:

since then several cases have been published, which along with the above are included in the thirty-six here analysed.

Clinical examination of the reaction is difficult. Henschen uses a special lamp for the purpose. One must not expect all pupillary reaction to be absent, only that it is plainly less marked when light is thrown on one side of the retina than when light is thrown on the other, and one must not forget that the presence or absence of a central field (the boundary ofthe hemianopic field passing through or skirting round the fixation point) must influence the phenomenon very considerably.

The cases are tabulated as follows:—

I.—LESION BEHIND OR BESIDE THE OUTER CORPUS GENICULATUM (KNIEHÖCKER).

(A).—Hemiopic Pupil Reaction Absent.

(*a*) *Hemianopsia absent.*

Case 1 (Henschen).—Lesion in right occipito-temporal lobe.

Case 2 (Henschen).—Lesions in both cunei and optic radiations.

(*b*) *Hemianopsia present.*

Case 3 (Henschen).—Lesions in cortex of both hemispheres and in both optic radiations.

Case 4 (Henschen).—Tumour in temporal lobe implicating optic radiations, and pressing on pulvinar.

Case 5 (Henschen).—Tumour in parietal lobe pressing on frontal section of optic radiations.

Case 6 (Henschen).—Lesion of hemisphere reaching to neighbourhood of tract and outer corpus geniculatum.

(B).—Hemiopic Pupil Reaction Present.

Case 7 (Henschen).—Tumour of temporal lobe pressing upwards, backwards and inwards, and pressing on central ganglia and the outer corpus geniculatum.

Case 8 (Henschen).—Hemianopic defect in one quadrant of field; tumour in fissure of Sylvius pressing on anterior portion of tract.

II.—LESION IN CENTRAL GANGLIA.

(A).—Hemiopic Pupil Reaction Present.

(*a*) *Recurrent hemiopic pupil reaction.*

Case 9.—Extensive changes in right occipital and left parietal lobes, in central convolutions, and in right pulvinar and inner corpus geniculatum. Outer corpus geniculatum only slightly affected.

Case 10 (Henschen).—Lesion in left hemisphere destroying the pulvinar and outer corpus geniculatum.

(*b*) *Permanent hemiopic pupil reaction.*

Case 11 (Henschen).—Clinical observation.

Case 12 (Henschen).—Destruction of corona radiata reaching to the thalamus, and another between colliculus anterior and thalamus.

Case 13 (Knies).—Clinical observation.

Case 14 (Dercum).—Thalamus and pulvinar and part of nucleus caudatus gliomatous. Corpora quadrigemina and tract intact.

(B).—Negative Cases, Hemiopic Pupil Reaction Absent.

Case 15 (Henschen).—Softening in pulvinar and corpora geniculata, and also in cortex of occipital lobe.

Case 16 (Henschen).—Gumma in under surface of pulvinar destroying the corpora geniculata.

Case 17 (Ruel).—Tumour of posterior corpus quadrigeminum implicating outer corpus geniculatum.

III.—LESION IN TRACT.

(A).—Positive Cases, Hemiopic Pupil Reaction Present.

Case 18 (Henschen).—Lesion almost microscopic of tract and adjoining part of thalamus.

Case 19 (Leyden).—Softening in lenticular ganglion and cerebral peduncle. Tract affected.

Case 20 (Martius).—Clinical observation.

Case 21 (Peters).—Injury with atrophy of tract.

Case 22 (Samelsohn).—Glioma of tract implicating thalamus and corpora quadrigemina.

Case 24 (Oliver).—Glioma of tract and corpus striatum pressing on tract.

Case 25 (Uhthoff).—Clinical observation.

Case 26 (Schmidt-Rimpler).—Atrophy of pulvinar and corpus geniculatum and partially of tract.

(B).—NEGATIVE CASES.

Case 27 (Norris).—Gumma implicating the tract incompletely.

Case 28 (Remak).—Clinical observation.

IV.—LESION IN CHIASMA.

(A).—POSITIVE CASES. HEMIOPIC PUPIL REACTION PRESENT.

Case 29 (Seguin).—Clinical observation of temporal hemianopsia.

Case 30 (Seguin).—Bi-temporal hemianopsia. Hemiopic pupil reaction present on one side.

Case 31 (Seguin).—Clinical observation.

Case 32 (Gullstrand).—Chiasma tumour.

Case 33 (Asmus).—Clinical observation of acromegaly.

Case 34 (Peretti).—Clinical observation in case of injury.

(B).—NEGATIVE CASES. HEMIANOPSIA WITHOUT HEMIOPIC PUPIL REACTION.

Case 35 (Story).—Clinical observation of supposed chiasma tumour.

(Also one case of Uhthoff's and three of Samelsohn's not more definitely described.)

V.—LESION IN OPTICUS.

Case 36 (Wilbrand). — Clinical observation of injury with monocular temporal hemianopsia and hemiopic pupil reaction.

From these cases we may conclude :—

(1) That the hemiopic pupil reaction is absent in softening of the occipital, parietal and temporal lobes, even when extensive and reaching to the neighbourhood of the corpora geniculata.

It is also absent in tumours of these parts, even when they have destroyed the optic radiations, and pressed on the pulvinar or the corpora quadrigemina.

(2) That mere pressure on the tract may cause the reaction.

(3) That lesions of the tract produce the reaction, as a rule, even when very minute, as in Case 18, a microscopic softening in dorso-medial portion of tract.

(4) Lesion of the outer corpus geniculatum seems not to produce the reaction.

(5) As to lesions of the inner corpus geniculatum, we cannot as yet form any certain conclusion.

(6) Destruction of the pulvinar does not cause the reaction.

(7) Destruction of the posterior corpus quadrigeminum does not produce it.

(8) Lesions of posterior segment of thalamus and pulvinar do cause the reaction—perhaps from pressure on tract, or by destroying the Brachium anterius.

(9) Lesions of the chiasma produce it, though occasionally for some unknown reason it is not present.

(10) It may occur in injury to the nerve, with monocular hemianopsia.

The course of the centripetal pupillary nerve fibres cannot be discovered by purely anatomical investigations. It is only by a combination of clinical observation with results of experiment that they can be finally traced to their origin. So much, at present, is certain, that they run in the optic tract at least as far back as the frontal border of the pedunculus cerebri, but whether they leave the tract to enter the thalamus before the outer corpus geniculatum or not, is uncertain. They do not appear to pass into that body, and Henschen's own opinion is, that they do leave the tract in front of it, and pass into the internal corpus geniculatum.

As regards the final termination of the pupillary fibres, he considers that they most probably end in the colliculus anterior, but he is careful to state that the hypothesis has not yet a scientific foundation. A lesion must be possible where hemiopic pupil reaction is present without hemianopsia, *i.e.*, a lesion of the pupillary fibres alone to the medial side of the tract. It has not been observed. If it exists it must be close to the inner corpus geniculatum, and may be accompanied with deafness of the ear of the opposite side, and also anæsthesia as the sensory fibres run in the immediate neighbourhood. As regards the pupillary fibres in the retina itself they probably are distributed all over the fundus. In the optic nerves we cannot be positive of their situation, but it is certain that they undergo a partial decussation in the chiasma. In the tract one observation of Henschen's goes to show that they occupy the dorso-medial border.

J. B. S.

CAMILLE FROMAGET (Bordeaux). Tetanus following Injuries to the Eye and its Appendages. Ocular Symptoms of Tetanus. *Archives d'Ophtalmologie, Nov.*, 1894.

The following interesting and rare case has occurred in the clinique of Professor Badal (Bordeaux).

A young man, 19 years of age, with no family or personal history of any importance to the matter in hand, received, when "assisting" at a village fair, a blow on the left eye from a rocket which had been let off at a distance of 30 metres from him. There was intense pain at once and free bleeding, with complete loss of sight. The hæmorrhage was checked by bathing with cold water obtained from the basin of a pump close by. Two leeches were applied to the temple, and in five minutes or so the hæmorrhage ceased from the eye and nostril. The patient was put to bed and cold cloths soaked in boracic lotion were applied. Four days after the accident, the remains of the eye began to suppurate, scanty whitish pus escaped and continued to do so; up to this time the temperature was normal and pulse 72. The patient, hitherto kept on milk diet, was now allowed to take solid food, and then for the first time difficulty in opening the mouth, and still more in masticating, was noticed. This trouble increased for six days more, when he consulted Professor Badal, and was admitted to his wards. On admission the stiffness of the jaws was very manifest, interfering with speech (though the patient was quite intelligent) and with mastication. The masseters were contracted and hard; the mouth could only be opened 1 cm.; the sterno-mastoids also were rigid, and the (good) eye was perfectly fixed; the patient could turn it neither up nor down, neither to right nor to left. The pupil reflex to light was abolished, that to accommodation was retained; the size of the pupil, the range of accommodation (he had hypermetropia of 0·75D.), and vision were all normal; so also were the lid movements. The patient was free from pain and had no general or partial cramps and no convulsions; temperature normal. On the day following his admission, the stump of the injured eye was removed under chloroform; a very small quantity of pus was present in the shrivelled globe which had a large wound through cornea and sclerotic, and was in parts firmly adherent to Tenon's capsule. Chloral and bromide of potassium as well as food were administered *per rectum*. On the following day there was slight opisthotonos, with rigidity of the abdomen; respiration regular, thoracic only. There was some photophobia and myosis with immobility of the eye. Two days later delirium began with general convulsive movements, set up by the slightest noise or touch, or even by a bright light. Pilocarpin, chloral, and bromide of potassium were administered *per rectum*. Three days afterwards the patient died convulsed, but sensible to the last; the temperature had risen to 99·8°. *Post-mortem* :—Nothing pathological was found, save congestion of the meninges.

After remarking on the infrequency of tetanus as a consequence of facial injuries, notwithstanding the liability of the face to traumatism, Fromaget gives notes of three more cases published by Pollock, Kirchner and Chisolm, in which tetanus followed injury of the eye. (Chisolm's case was one of enucleation for tumour.) He also mentions a case of Denucé's, reported by Chevalier, where tetanus followed the operation of reclination. Notes are next given of twelve cases in which the cause of tetanus was a wound in the orbital region; and four more where the eyelid was injured; these are extracted from various journals, &c.

Proceeding in the second part of his article to discuss these cases, Fromaget remarks upon the frequency among them of "Rose's tetanus," that form, namely, whose peculiarity consists in the addition of paralysis to spasm. The paralysis (of the facial nerve) is much more frequently on the same side of the face as the seat of the injury; more rarely on the opposite. Rose's original explanation of the paralysis was that it was produced by inflammation, swelling and compression of the nerve in its bony canal, but *post-mortem* examination scarcely bears out this theory. Oliva suggested the local infection by the products of the tetanus producing microbe. The author also accepts the toxic theory of both paralysis and spasm, and in answer to the question: "Why is the facial nerve selected?" points to the manner in which other toxic paralyses select certain nerves—notably diphtheria, which selects the ciliary muscle and the palate; and lead, which attacks the extensors: if these, then why not tetanus?[1] But it has now been found that the facial is not the only nerve paralysed, the muscles of the eye may be affected, for Rockliffe and others have observed ptosis, strabismus, and immobility of the eye; and sensory disturbances in the area of the fifth nerve have been noted. The occurrence of paralysis as an early symptom in tetanus, and of alternations of paralysis and convulsion have been not seldom observed. We do not yet know what is the reason for the occurrence of paralysis or of spasm in tetanus; it may be that the tetanus poison, like rabies poison, may produce convulsions when in small doses, or when the resistance is great; and paralysis when the dose is large, or the recipient is of feeble resisting power. For it is not probable that the same organism could produce both a tetanising and a paralysing power.

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[1] But forty-nine times out of fifty these paralyses are bilateral, a fact which of itself is strongly suggestive of a toxic cause, while in Rose's tetanus there is paralysis of one side of the face and spasm of the other. The explanation may be correct, but the argument is quite unsound.—W. G. S.

The third portion of Fromaget's paper deals with the ocular manifestations of tetanus. He says with justice that these have not been sufficiently closely observed as yet, for oculists only very rarely see the disease in their own practice, and the general surgeon is apt to overlook these symptoms. Ectropion of the lower lid with consequent epiphora, twitching and spasm of the eyelids, ptosis, stiffness, rigidity, and a sense of heaviness in the lids, and paralysis of the muscles of the eye have all been observed in various cases as early and solitary symptoms. In general contracture of all the muscles of the eye, which condition Fromaget believes to have been present in his case above narrated, the eye remains fixed in one position as in ophthalmoplegia, while the patient is obliged to turn his head in order to direct the macula to any desired spot. There may even at times be paralysis of some and not of others of the ocular muscles producing various conditions of strabismus. With regard to the state of the pupil, numerous observers have noted extreme myosis; Jacobson alone has recorded mydriasis. In his case, Fromaget was able, in spite of the fact that the pupil was very contracted, to satisfy himself that the range of accommodation was equal to the normal for the age of the patient; that there was no spasm of the ciliary muscle.

W. G. Sym.

RISIEN RUSSELL (London). An Experimental Investigation of Eye Movements. *Journal of Physiology, vol. xvii.*, 1, 1894.

This paper is the record of careful and laborious research, and is interesting not only because the results obtained add appreciably to our knowledge of the subject under investigation, but also because some of these results were foreshadowed by Dr. Hughlings Jackson, as an outcome of reasoning in his usual philosophical way.

The paper contains nine sections. With sections 1 and 2, introductory and historical, we need not, at present, concern ourselves. Section 9 consists of a discussion of the results, and with it we shall chiefly deal in this abstract. The intermediate sections are as follows:—(3) Ocular movements represented in the cerebral cortex; (4) Re-appearance during narcosis of ocular deviations, artificially produced and recovered from; (5) Position of the eyes of normal dogs during narcosis (control); (6) Influence of the cerebellum on ocular movements; (7) Control experiments on the labyrinth and eighth nerve; (8) Effects of removing one lateral lobe of the cerebellum and part of the eye-area of one cerebral hemisphere.

Representation of Ocular Movements in the Cerebral Cortex.—The results obtained leave no doubt (the author states) that all the movements of the eye-balls are represented in the cerebral cortex, and not lateral movements only. Hughlings Jackson surmised that the reason why none but the lateral deviations of the eyes had been obtained by excitation of the cortex, might be that these movements are so much more powerfully represented that they overpower the vertical and other rotations when the eye area is stimulated. After excluding the possibility of lateral movement of the globes to the side opposite to that stimulated by division of the recti muscles concerned, it was found that stimulation of that cortical area which had previously occasioned lateral movement only, evoked movements of the eyes in every other direction according to the exact area of the cortex excited. Rotation upwards and downwards, and up and down and to the opposite side could be elicited with great constancy. These results entirely support Hughlings Jackson's hypotheses.

Re-appearance during Narcosis of Ocular Deviations Artificially Produced and Recovered from.—When part of the cortical area for conjugate eye movements to the opposite side is removed, the eyes turn towards the side of the lesion, but recover their normal position after an interval which varies with the severity of the cerebral lesion. If the animals are anæsthetised, after the globes have recovered their normal position, the original deviation towards the side of the lesion recurs. The most probable explanation of this phenomenon is that advanced by Hughlings Jackson, who suggested that after destruction of part of the cortical representation of eye movements, certain nervous arrangements concerned in rotation of the eyes to the opposite side are permanently lost; under these circumstances the hemisphere containing only a portion of its nervous arrangements would give out under the influence of an anæsthetic before the intact hemisphere, and hence the rotation of the eyes *towards* the side of the lesion.

Control experiments on normal dogs made it evident that with an uninjured brain the centres in the two hemispheres do not give way simultaneously during narcosis. It seems probable that the ocular representation is unequal in the two hemispheres, and that in which there is less representation gives out first.

The Influence of the Cerebellum on Ocular Movements.—The results of these experiments support the author in the opinion he had previously expressed that the ocular deviation produced by ablation of part of the cerebellum is a paralytic and not an irritative phenomenon. Like all other paretic symptoms which result from destruction of parts of the cerebellum, it is open to question whether the effect is due to the taking off of some direct influence of the cerebellum from the muscles, or to an indirect effect on the muscles brought about through the agency of the cerebral hemisphere of the same or opposite side by the removal of some cerebellar influence. The author is of opinion that the former is the more likely explanation. The fact that after recovery of the normal position of the globes, the deviation recurs under the influence of an anæsthetic, supports his contention that such deviation is paralytic in origin.

With regard to the nystagmus caused by removal of parts of the cerebellum, it is found that two varieties are met with; one is spontaneous, and probably an irritation phenomenon; the other, which becomes manifest only on voluntary movement of the globes, is, in all likelihood, a paralytic phenomenon, due to weakness of the muscles producing rotation in any given direction, or of their opponents.

The Effects of removing one Lateral Lobe of the Cerebellum and part of the Eye-area of one Cerebral Hemisphere.—Two antagonistic influences appear to be exerted on the extrinsic muscles of the eye, one by the opposite lateral lobe of the cerebellum, the other by the eye-area of the opposite cerebral hemisphere. When either influence is lost an abnormal position of the eyeball results, but if both are simultaneously removed, the position of the globe is practically normal. Or, stated in another way, one lateral lobe of the cerebellum (say left), and the opposite cerebral hemisphere (say right) act in conjunction and induce movements of the eye in one direction; the other lateral lobe of the cerebellum (right) and the other cerebral hemisphere (left) are responsible for an influence which tends to move the eye in an exactly opposite direction.

J. B. L.

Reinhard Otto (Berlin). The Effects of Arterial Sclerosis on the Optic Nerve. *J. Springer, Berlin*, 1893.

This monograph of 132 large octavo pages is based on the *post-mortem* examination of twenty-one cases of sclerosis of the basal cerebral vessels among the inmates of a lunatic asylum. Twenty of the cases were examined microscopically, as well as three other cases where the optic nerve exhibited somewhat similar changes without the arterial lesion. These Otto believes to be examples of congenital malformation. Congenital malformation of the optic nerve has been described by Michel and Siemerling when the nerves were partially bisected by a connective tissue growth running into the lower portion of the nerve in the neighbourhood of the foramen opticum for a distance of 1½ cm.

Changes in the nerves produced by pressure of tumours and aneurisms have been described by Türck and Michel, and Oppenheim and Siemerling have suggested the possibility of neuritis observed in bulbar paralysis being the effect of endarteritis.

Bernheimer has reported cases where definite effects were produced on the optic nerves by endarteritis, and Otto's object in this paper is to ascertain, by examining a large number of cases, what changes are usually produced in the optic nerves by disease of the walls of adjoining blood vessels, and how these changes are brought about.

Otto divides his cases into two groups, of which the first (six cases) either exhibit no lesions, or only a very slight one of the optic nerves, while the second group (fifteen cases) shows well-marked changes.

The six cases of the first group were all cases of dementia, four of whom had pseudo-bulbar paralysis, one was paralytic, and one hemiplegic. In one there was found *post-mortem* sclerosis of the carotids, and evidences of pressure on the optic nerves, but no deep indentations or notches from sclerosis of the ophthalmic artery such as were found in the second group of cases.

The optic nerves were either normal in shape or partly distorted by the pressure of the blood vessels, but exhibited no distinct signs of inflammation or of atrophy. Slight thickening of the nerve sheath was present in some of the cases, but no definite increase of nuclei. Some of the smaller blood vessels of the nerve itself were sclerosed, and corpora amylacea, with "Fuchs' atrophy" were present in several of the cases. Functional examination was not possible in these patients, and the ophthalmoscopic appearances were normal in all the cases examined except one. In the absence of nerve atrophy and inflammation Otto's cases differ greatly from those described by Oppenheim and Siemerling, which presented similar microscopic appearances. Indeed, the fifteen cases of the second group present lesions of a different nature, and in a different position from those described by these authors. In all of them the optic nerve exhibited considerable alteration of form from the pressure of the blood vessels (carotid and ophthalmic arteries), as well as distortion and partial atrophy of certain groups of nerve fibres.

The fifteen cases (Nos. 7 to 21 inclusive) were all cases of dementia, three being examples of senile dementia, six of paralytic dementia, two of dementia with pseudo-bulbar paralysis, three suffering from epilepsy, and two from hemiplegia. One of the hemiplegic cases had also senile dementia and hemianopsia. Chronic nephritis and retinitis were present in one case of pseudo-bulbar paralysis. One case had "glands" in optic papilla, with corresponding disease in the nerve.

The microscopical appearances are described with elaborate minuteness. Suffice it to state that in all cases the nerve was altered in shape, in the neighbourhood of the optic foramen, where it came in contact with the diseased carotid or ophthalmic artery, and certain bundles of nerve fibres were similarly altered in shape, and in aggravated cases, atrophic.

Three cases of congenital deformity of optic nerves are also described :—

Case XXII.—An imbecile, small congenital indentation at upper border of both nerves behind the foramen.

Case XXIII.—Paralytic dementia. Shallow grooves behind the foramen in both nerves, with Fuchs' atrophy in the bundles of nerve fibres at bottom of groove.

Case XXIV.—Paralytic dementia. Congenital coloboma of left and partial of right nerve.

The anatomical situation of the optic nerve in the foramen opticum exposes it to injury from arterial pressure, and just behind the foramen where it passes over the carotid artery it is hemmed in by a process of the dura mater, which Otto terms processus opticus or operculum opticum, which renders it nearly as liable to suffer from pressure as in the bony canal. Further back, although a tortuous carotid may be in contact with the nerve for a considerable distance, it is not surrounded by rigid structures, and arterial pressure cannot produce much damage. The relation of the ophthalmic artery and optic nerve are subject to several varieties, and the effect of dilatation of the artery upon the nerve will differ in different subjects.

In all the fifteen cases of the second group there was present, besides the microscopic change of shape of the nerve, also an alteration in the form of certain nerve bundles, and of the corresponding septa. These bundles were oval in section, and in the more marked cases, somewhat flattened, with more or less distinct atrophy of nerve fibres.

Otto has examined numerous normal optic nerves, and has never seen any such large group of flattened or oval bundles as were present in all these cases. In the cases of congenital anomaly also the oval or flattened bundles present are either distributed quite irregularly or run parallel to the radial septa, while in the cases here examined they always ran parallel to the diseased blood vessel, in a curved line, the concavity towards the blood vessel. In some of the cases the nerve bundles next the vessel preserved their circular shape, while only the bundles in the centre of the nerve exhibited the signs of compression, and in others the more peripheral bundles were also affected, sometimes those next the blood vessel, sometimes those at the opposite side of the nerve, and sometimes both sets of peripheral fibres.

The nerve bundles of normal form presented no pathological appearances whatever, with the exception of a peripheral zone of atrophy in one case (XI.). The septa, too, were normal except in one case (XII.).

The nerve sheath was essentially normal, except for a thickening in proximity to the diseased blood vessel.

Otto attributes the changes observed in the optic nerves to direct compression by the enlarged blood vessels when the nerves are lying in a bony canal or bound down by a fibrous septum. The curious fact that the central nerve bundles always, and those at the opposite side occasionally, suffer more than the fibres in proximity to the blood vessels has its analogy in the effects produced upon the spinal cord by tumours of the dura mater. Kronthal observed that the side of the cord opposite to the tumour was sometimes the part principally atrophied, and Otto describes a similar observation made by himself.

Otto acknowledges that the appearances in his observations bear a certain resemblance to what is seen in congenital coloboma or congenital fissure of the optic nerve, but the differences are so marked that there is no difficulty in differentiating the two conditions.

When the compression is sufficiently great to produce atrophy of nerve fibres, the lesion can be traced both upwards and downwards in the course of the affected nerve, as is shown best in Case XXI. In the more central portion of the nerve the disappearance of nerve fibres is the most marked phenomenon, and the other tissues show no definite changes except, of course, what results from the fact that the size of the whole nerve is diminished. In the more peripheral portion of the nerve the destruction of the nerve fibres is never complete, and there is found enlargement of the septa, with increase of nuclei, and also reduction of the neuroglia.

The changes in the central part of the nerve may therefore be regarded as sclerosis resulting from degeneration. The changes in the peripheral portion are analogous to those seen by Marckwort after section of the nerve in dogs, and described by Siemerling in a case of descending atrophy in man, and correspond in all essentials with the observations of Schmidt-Rimpler, v. Monakow and Moeli on the changes in the optic nerves after long-standing central lesions.

So far as the nerve lesion is concerned the ophthalmoscopic appearances were abnormal in only one case, where there was a grey discolouration of the temporal half of the papilla. The ophthalmoscopic changes in the other cases were not due to the effects of the arterial pressure. No conclusions as to the functional lesions can be drawn, as in nearly every case functional examination was impossible.

J. B. S.

MITVALSKY (Prague). A Study of the Bony Tumours of the Orbital Region. *Arch. d'Ophtal.*, Oct., 1894.

Two cases of osteoma of the frontal sinus, with histological researches on the pathological products of the mucous membrane of the frontal sinus are described in this paper.

We are far from exact knowledge concerning osteomata of the frontal sinus, either as to their clinical or their anatomical aspects. The questions yet to be decided are :—

Should a radical operation be done, and at what time?

Should we resect the part protruding into the orbit and threatening destruction to the eye?

At what time should these operations be undertaken?

Would it not be better to abstain from operative interference?

The clinical picture of these tumours is rather uniform, generally consisting of a bony elevation in the region of the frontal sinus accompanied by a bony growth in the neighbouring orbital cavity, and by exophthalmos. Marked differences in the pictures presented are due to the fact that these tumours arise in different parts of the sinus wall, and then assume various directions of growth. Other modifications are due to the different relations of the tumour to the mucous membrane of the sinus. Most of the tumours, after filling the frontal sinus, spread forward into the orbital cavity, growth into the cranial and nasal cavities being a still later stage of their development. Some, however, spread equally forwards and backwards, others backwards only into the cranial cavity, the diagnosis in the last case being extremely difficult or even impossible. Virchow has described a classic example of this last variety, in which the cerebral surface of the tumour was studded with a number of cysts varying in size from that of a lentil to a hazel-nut. The outer layer of the cyst walls was the dura mater, the inner was covered with cylindrical epithelium with vibratory cilia. The adjacent brain substance was softened over a large area. As to the effect produced on the mucous membrane of the sinus, we must consider the pathological changes in the membrane, and the dislocation of the membrane or its *débris.* The pathological process consists of a chronic inflammation leading to a more or less abundant secretion into the sinus of mucus or muco-pus. This secretion is accompanied by the formation of mucous polypi, such as are so often found in chronic inflammation of the nasal cavities and the neighbouring sinuses. In some cases, where the sinus is not obliterated, but the outlet blocked, the accumulation of this secretion gives rise to a dilatation and thinning of the mucous walls of the sinus. Sometimes the mucous membrane is divided into several small multiple cysts, simple or confluent, filled with the same secretion, and tending to continuous growth, owing to the uninterrupted secretion of their walls. Thus the area of the primary membrane may be increased several fold. These cysts are, of course, dislodged by the growing tumour, and are always found at the top of the tumour; by top we mean the part most distant from the place where the tumour originated. Thus the position of the cysts might determine the point of origin of the tumour; a growth arising from the upper part of the sinus wall would probably displace the cysts towards the inner angle of the orbit; a growth from the medial sinus wall towards the superior wall of the orbit; and a tumour from the anterior plate of the frontal bone would push the mucous membrane and its products back into the cranial cavity, as in Virchow's example. We must not forget the other factors determining the direction of displacement, notably the resistance offered by the plates of the frontal bone. It is really only after these latter have atrophied and become absorbed that the cysts can wander into the orbital tissue or cranial cavity and grow more freely. The same is true of the mucous polypi in those cases where the hypertrophied mucous membrane has not formed any cysts, but merely served as partial envelope to the tumour. Then we find a large number of polypi adherent to this envelope and perhaps detached polypi in the orbital tissue, possibly also in the subcutaneous tissue and beneath the dura mater. The cysts are not always stationary. Their walls may be the seat of a purulent inflammation leading to perforation and fistula. It is not a rare occurrence to find, especially in the orbital region, several fistulæ on the surface of the osteoma, whence exudes a mucous or muco-purulent discharge. These fistulæ are always a disagreeable complication, as they give rise to recurrent exacerbations of inflammation and pain. Such a purulent inflammation leading to fistula in a cyst dislocated towards the brain may cause death.

Case I.—A girl, aged 14, entered the hospital on June 19, 1890, with right exophthalmos. She had been ill several times, and for years had suffered from "cold in the head," and periodical headaches. Towards the end of 1889 she was struck violently by a cow's tail in the right orbital region, and she affirmed that at that time the eye began to be prominent. No diplopia. General appearance good. Considerable prominence over the right frontal sinus, but the orbital margin well defined. The right eye was proptosed 2 cm. and displaced outwards and downwards $1\frac{1}{2}$ cm. The palpebral aperture was considerably increased, but the lids could still be closed. The upper and inner part of the orbit was occupied by a bony tumour. Just above the inner canthus the tumour showed a flattened cyst of the size of a hazel-nut which fluctuated and was covered by thin skin only. The globe was quite normal and freely movable in all directions.

The tumour evidently took its origin from the upper wall of the sinus. There was but the one cyst, and when this was opened a large quantity of muco-pus escaped. Some of the epithelium scraped from the cyst had vibratory cilia. The incision resulted in a fistula. Weiss, at that time surgeon in Prague, attempted an operation, but stopped when he found that the tumour had invaded the ethmoidal cells. He found another cyst in the orbit, which he emptied, thus establishing a second fistula. From this time the exophthalmos increased. Ophthalmoscopic examination revealed engorged vessels on the disc, and a grey halo around it, indicating pressure on the optic nerve. Around the limbus cornea were recurrent phlyctenular excrescences. The fistulæ closed temporarily, and reopened discharging a large quantity of muco-pus.

In July, 1891, the growth had invaded the left frontal sinus, and then measured 9 cm. in length, 6 cm. in width, and 2 cm. in height, with a nodular surface, and lobulated periphery. The frontal diameter of the orbit was reduced to one-third of its original size, and the posterior pole of the globe was in immediate contact with the inferior orbital margin. The globe was displaced downwards $2\frac{1}{2}$, outwards 2 cm., and its movements upwards and inwards were very much reduced. The lids were also proptosed and still covered the globe well. Externally, the eye was quiet, but ophthalmoscopically there was severe engorgement of the retinal and choroidal vessels, without inflammatory symptoms. Swelling of optic disc 0·6 mm. V. = $\frac{6}{10}$.

Towards the end of 1891, a small tumour could be felt on the upper and inner wall of the left orbit, which did not cause any exophthalmos. The nasal fossæ were blocked, but, apart from periodical headaches, there were no cerebral symptoms. In the beginning of 1892 Maydl, the successor of Weiss, determined to perform a radical operation. The growth was of ivory hardness and was pearly white in colour. The periosteum was easily detached with the skin flap. The tumour, of the size of a man's fist, was separated from its connections with the cranial bones. It had already caused atrophy of a great part of the orbital plate of the frontal bone; a large, firmly adherent part of the dura mater was torn off with the tumour. The brain was nowhere flattened. Only that portion of the bone forming the optic foramen was preserved, so that when the eye resumed its place, the torn dura mater alone separated it from the brain. Thus the pressure of the brain again gave rise to an exophthalmos; the nasal fossæ also were again free, so that the cellular orbital tissue was in direct contact with the air. Despite the bad prognosis the patient left the hospital a few weeks after the operation apparently cured. The eye was movable, V. = $\frac{6}{18}$, and the part of the skull where the tumour had been was soft.

In 1893 she returned with severe symptoms of brain pressure. Maydl removed a small recurrence, since when the girl has remained quite well. This tumour weighs 180 grammes, and shows in its depressions thin bony films which, when picked off, disclose a layer of red connective tissue, with a large number of different sized mucous polypi adherent to it. These polypi occupy principally the antero-inferior surface of the growth; on the cerebral side the polypi are absent, and the tumour envelope is much finer.

The periosteal capsule is easily detached, except in the furrows. The connective tissue layer is very soft, and, judging by the polypi, made up in places of the periosteum of the osteoma and of the remains of the mucous membrane of the frontal sinus. At the site of the fistulæ this soft envelope is thickened, and is dark red. Histologically, the envelope is made up of two layers easily distinguished in the thicker parts. The inner layer, firmly adherent to the osteoma, although serving as periosteum, is quite different histologically from normal periosteum. It is composed of parallel elongated cells, or rather cellular fibres, without elastic or connective tissue fibres. The nuclei are fusiform, almost linear. There are 25 to 30 layers of cells, which in their undulating course resemble non-striated muscle and new connective tissue, which, no doubt, they really are. They are grouped in bundles of varying size. In some places these cells are short, with oval or fusiform nuclei, forming a soft formation tissue, as is found in granulation tissue. In other places both kinds of tissue are mingled. The outer layer is present only on the antero-inferior surface of the osteoma; it is divided into two distinct layers:—(1) Adherent to the periosteum, very vascular, having the character of submucous connective tissue. (2) Presenting the appearance of a tunica propria, covered in some places by a layer of epithelium. This tunica propria bears evidence of chronic inflammation. It is a granular tissue, composed of embryonic cells, organising in places and cicatrising in others (granulation tissue). Scattered through it are small round lymphatic cells, which are especially numerous towards the lower border. Near the surface there is an infiltration of pus.

In several places, especially round the fistulæ, the differentiation between the tunica propria and the tunica submucosa is absent, granulation tissue being present there, containing many globules of pus and numerous vessels, the walls of the latter thickened and surrounded by an infiltration of lymphatic cells. At these points also, especially in the level of the tunica mucosa, are many large dark granular cells, with uneven contour—"Mastzellen." The epithelial layer is entirely absent at these points, but over the greater part of the mucous membrane it is preserved, and has the character of stratified cylindrical epithelium, the cells and nuclei being elongated perpendicularly. In some places the epithelium bears a layer of vibratory cilia. In other places the epithelium is modified and presents the character of transition epithelium (Henle's "Uebergangsepithel"), the superficial cells are swollen and have round nuclei, the deeper layer alone preserving the cylindrical form.

Both kinds of epithelium are of varying thickness. The disposition of the vessels is also interesting. Countless vessels are found running from the connective tissue layers, perpendicularly to the surface of the osteoma.

The mucous polypi are divisible macroscopically into (1) Those with a smooth shining surface. (2) Those with a villous velvety appearance. The smooth polypi are mostly formed of soft connective tissue, with large meshes, resembling the loose submucous connective tissue. They contain a small number of connective tissue fibres with fixed flat cells having a round nucleus surrounded by abundant protoplasm, round lymphatic cells, and some granular cells like pus globules. In the centre of the pedicle the tissue is very lax and contains a large number of vessels. In the intermediate parts of the polypi the tissue becomes denser, and the vessels, although greater in number, are smaller in size and surrounded by a more pronounced infiltration of lymphatic cells, which here and there amounts to true follicular formation. The number of granular cells is also greater. Beneath the epithelium the number of connective tissue cells increases, and they become condensed. There is a stratum of connective tissue resembling reticulated tissue, so that the layer has all the characteristics of a true mucous membrane. A few "Mastzellen" are also present here. The continuous epithelium covering this layer is the same in quality as that described above. The chief difference between the smooth and the villous polypi consists in the presence in the latter of a large number of lymphatic cells, and of an enormous quantity of "Mastzellen." In some places the lymphatic infiltration gives rise to formations similar to lymph follicles.

From the surface of these polypi spring innumerable papillæ composed of the same reticulated tissue as the surface of the polypi, and presenting the same infiltration with leucocytes. As a rule the papillæ branch. They are all covered with a regular epithelium, uniform throughout, so that we have the picture of a classic papilloma. As in similar formations, the cross section shows in some places deep furrows, in others empty tubes lined with stratified cylindrical epithelium bearing vibratory cilia. The epithelium has four or five layers of cells arranged with great regularity, the nuclei varying from round to fusiform. The fundamental layer has cubical cells with round nuclei. Here and there are a few degenerated cells, and some of the superficial cells contain a large amount of mucine.

This combination of periosteum and of the *dêbris* and products of the mucous membrane is found only on the antero-inferior surface of the tumour envelope.

M. W. FREDRICK.

H. V. WÜRDEMANN (Milwaukee). Report of a Case of Thrombo-phlebitis of the Central Retinal Vessels, with Microscopic Examination. *Archiv. of Ophthal., Oct.*, 1894.

The interest of the following case depends chiefly on the facts that it was observed from its onset throughout the course of the disease, and that the eye finally was excised and examined microscopically.

C. W., a boy aged 8, was first seen by the writer in January, 1893; the history was that the left eye had become suddenly blind four days before. There was nothing in the family or personal history to throw light on the case, unless it be that about a fortnight before the blindness occurred he had an attack of mumps, but had recovered quickly and well. The heart was normal and the urine healthy. Right eye normal, V. = $\frac{6}{6}$. Left eye, pupil slightly dilated and without reaction to light; associated pupillary movements good. V. = 0. Fundus showed a great deal of change. The central veins were completely closed, and vasculitis and perivasculitis had apparently set in. The disc and retina surrounding it seemed to be filled with blood, while there were also isolated flame-shaped hæmorrhages and whitish lines here and there. The border of the disc, or rather as much of the border as was left uncovered by hæmorrhage, was slightly blurred, but there was no swelling. Arteries much constricted, while the veins were very tortuous and dilated, or filled with blackish-red — apparently coagulated — blood. Hæmorrhages in some places, and opaque retinal tissue in others, obscured both arteries and veins; œdema at the macula was very conspicuous, and there were numerous hæmorrhages radiating from the edge of the macula, which were lighter in colour than the hæmorrhages elsewhere. There was a spot at the fovea irregularly star-shaped, and dark at its centre, which at the first glance looked rather like the cherry red spot of embolism; but more careful examination convinced the author that it was really a hæmorrhage. All the signs pointed to thrombosis rather than embolism, and Würdemann thinks its starting point was an active phlebitis of the central veins. He suggests that the phlebitis may have resulted from a morbid condition of the vessel walls, induced by the attack of mumps which preceded the failure of sight. Alteration of the vascular coats, chiefly in other parts of the body, has of course been frequently observed in infectious illnesses, so that the writer has some grounds for the suggestion which he makes.

The child remained under Würdemann's observation for a week. Iodide of potassium in large doses and tonics were given, and renewed search was made for any abnormality in the heart or other organs, but without result.

A month later the patient returned to report. Right eye still normal. Left eye, ophthalmoscopic appearances had greatly changed, optic nerve slightly cupped, white, and atrophied. Hæmorrhages seen now only as greyish-white patches. Arteries appeared as nearly white streaks, veins in parts of normal size, in other places distended with unabsorbed clotted blood. Whitish-yellow spots surrounded the macula, while at the fovea there was a white spot with pigmented edges. A year later, January, 1894, the boy was again brought to Würdemann, this time with acute glaucoma in the injured eye. He had had several attacks of pain which were becoming more frequent and more severe.

The globe was enucleated, and hardened in Müller's fluid.

Macroscopic examination showed all the characteristic appearances resulting from increased tension. Both retina and choroid were in part detached, but the author has little doubt that this was due to the manipulation of the specimen. There was a large sheet of connective tissue in the vitreous with small strands of similar tissue, extending from the lower part of the retina. This was seen also ophthalmoscopically shortly before the eye was excised.

Microscopic sections were cut and stained in hæmatoxylin and picric acid. Cornea, lens, and sclerotic, were all found to be normal. The iris was, in part, adherent to the anterior lens capsule by fibrinous deposit. There was marked hyperplasia of connective tissue cells in the ciliary region, and the canal of Schlemm was hardly recognisable. Connective tissue degeneration of retina and choroid was observed, and in the macular region the granular layer of the retina contained blood corpuscles which were undergoing fatty degeneration. In the optic nerve the changes were marked and pointed to antecedent phlebitis and thrombosis with perivasculitis and ensuing atrophy. There was great increase of the interstitial connective tissue, the walls of the perivascular spaces were thick and the spaces themselves occluded. Both artery and vein were plugged with a fibrinous clot, that in the artery being more complete than the one in the vein. The outer coats of both vessels were greatly thickened, but the inner coat was intact, showing, says the author, that there had been no hæmorrhage into the nerve tissue.

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